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Exploring Options for Public Green Space Development: Research by Design and GIS-Based Scenario Modelling

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Abstract: Green spaces have a positive influence on human well-being. Therefore, an accurate evaluation of public green space provision is crucial for administrations to achieve decent urban environmental quality for all. Whereas inequalities in green space access have been studied in relation to income, the relation between neighbourhood affluence and remediation difficulty remains insufficiently investigated. A methodology is proposed for co-creating scenarios for green space development through green space proximity modelling. For Brussels, a detailed analysis of potential interventions allows for classification according to relative investment scales. This resulted in three scenarios of increasing ambition. Results of scenario modelling are combined with socio-economic data to analyse the relation between average income and green space proximity. The analysis confirms the generally accepted hypothesis that non-affluent neighbourhoods are on average underserved. The proposed scenarios reveal that the possibility of reaching a very high standard in green space proximity throughout the study area if authorities would be willing to allocate budgets for green space development that go beyond the regular construction costs of urban green spaces, and that the types of interventions require a higher financial investment per area of realised green space in non-affluent neighbourhoods.

Keywords: public green space; urban green; proximity; accessibility; scenario; GIS; decision support tool; sustainable urban development; environmental justice

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1. Introduction

1.1. Access to Public Green Spaces and Quality of Life

With an expected population increase of 28% by 2060 [1], Brussels is facing the challenge of improving urban environmental quality [2] while absorbing strong demographic growth. A good understanding of access to Brussels' public green spaces (GS) is required, as these are essential for the well-being and quality of life of the region's inhabitants. This is not only important for the current state, but also for future development scenarios, as visiting urban green spaces has a general positive connection to reduced mortality [3], health protection [4], obesity in children and adults [5,6], and psychological well-being [7]. Next to mitigating impacts of air pollution and urban heat [8], reducing flood risk [9], and contributing to groundwater recharge [10], urban GS offer opportunities to reconnect with nature and self [11], resulting in a feeling of rejuvenation, enhanced contemplation, and a sense of peace and tranquillity [12–15]. Access to urban GS has a positive effect on the development and well-being of children [16] and may contribute to coping with a wide range of behavioural problems [17].

1.2. Green Space Accessibility Modeling

Standards and indicators for access to public GS come in many forms, and variations exist on the GS size levels that are taken into consideration and on the type of paths used for calculation (Table 1). GIS software is the prevailing tool for spatial analysis of GS accessibility. The simplest form—GS percentage or GS area per inhabitant—requires no distance calculation. The indicator has a low resolution and least reflects the inhabitant's perception. When analysis is performed from the point of view of the inhabitant through focal (moving) neighbourhoods, access routes are either neglected and replaced by a unidirectional field (with barriers [18–20] or without barriers [21–24]), or a path/road network is considered [25–28]. One can also differentiate between road networks depending on the age of the users [29] (e.g., children and elderly having difficulty crossing specific roads). A public GS is considered accessible when the distance to it does not exceed the norm. To define this norm, some studies apply a single maximum distance [18,21–24,29], others stratify GS according to size classes [19,23,25–28], and a third—so far not implemented—approach is to have a maximum distance specific to, and as a function of, the GS area [20,25]. The most advanced models and indicators reflect user perception more by depicting paths and destinations more realistically [25–28]. Several studies use the GS accessibility models to analyse the relation between GS accessibility and socio-economic variables, such as well-being [18,22], age [21,29], education, and income [23]. Other studies use the models to analyse scenarios [24]. However, the influence of scenario developments on environmental justice (through socio-economic indicators) remains understudied.

Table 1. Characteristics of green space accessibility models and indicators.

	Fixed Neighbourhoods	**Focal (Moving) Neighbourhoods**			
		Euclidian Distance (Buffer)	**Pathway**		
			Euclidian with Barriers	**Road Network**	
				Indiscriminate	**Age Dependent**
No distance criteria	GS percentage or GS area per inhabitant	n.a.	n.a.	n.a.	n.a.
Single level	-	Rocha & Ramos [24] Grazuleviciene et al. [22] Reyes [21]	Larson et al. [18]		Rigolon [29]
Multi-level	-	Gupta [23]	Herzele & Wiedemann [19]	Stessens et al. [25] Seifu & Till [26] Comber et al. [27] Martins & Pereira [28]	-
Size–distance relation	-	-	Mentioned in Herzele [20], not implemented	Mentioned in [25], not implemented	-

1.3. Unequal Distribution of Urban Green Space and Accessibility Benefits

In an urban context, GS provision is often unequally distributed [19,30]. Many studies reveal that GS accessibility predominantly benefits more affluent communities [31,32]. This is also the case for Brussels [25]. Disproportional access to green spaces is therefore increasingly recognized as an environmental justice issue [33]. Planners and policymakers are nowadays challenged, not only with the need to enhance the provision of GS across the city, but also with questions of justice regarding GS access and multi-functionality of GS, and provision of a healthy urban environment for all citizens. Recent studies have also highlighted the undesirable effects of urban greening, such as gentrification, whereby the added quality of urban green tends to 'push out' less affluent residents [34,35]. The benefits of bringing nature into neighbourhoods can be countered by destabilization of neighbourhoods through property value pressure, unequal access, and unequal benefits. For greening strategies to be inclusive, there has to be a deliberate acknowledgement of socio-spatial inequalities, and they have to be planned in a way that they can serve as places of encounter for different groups of people [34]. In this study, therefore, particular attention is paid to neighbourhoods with low average income.

The imperative to address environmental injustices and related health issues, as well as enhancing urban nature and biodiversity, has led planners to focus on traditional parkland acquisition programs, deployment of underutilized urban land, and defining innovative strategies for expanding green space resources [36]. Such open space development, however, can create an urban green space paradox in poor areas [33], where improved attractiveness increases property value. The average income in the BCR was €13,535 in 2013, which is 21% under the average Belgian income [37], with the lowest median incomes situated in the canal area. This is the historical industrial area, which is densely populated, and which has a low public green space proximity score. The highest median income areas are situated in the 'second crown' of the region and mostly in the southeast quarter of the area. The numbers do not include foreign diplomats, who have not been taken up in the national register.

1.4. Alternative Scenarios and Innovative Design Strategies

In all the challenges mentioned, the changing climate has agency. It not only forms but also alters the socio-political context in which GS and green infrastructure are developed [38]. To address these challenges, there is a strong interest in the formulation of design options, as well as in assessing the impact of alternative scenarios for urban GS development [39]. The preferred method for the formulation of design options/opportunities for GS development (OGSD) is collaborative design, supported by indicators of the current state of GS proximity. The co-production of scenarios through design and the impact assessment of alternative design options, along with the scientific and practical output it delivers, can be considered as research by design (RbD), that is, an inquiry in which design is a substantial part of the research process, forming a pathway to new insights through the inclusion of contextualized possible alternatives, validated through an interdisciplinary peer review of experts [40].

1.5. Objectives

The main objective of this paper is to present a GIS-based method for developing and analysing scenarios with a focus on environmental justice. This objective implies the identification of possible GS development scenarios for the Brussels' study area and the assessment of how these scenarios benefit the population of Brussels as a whole, as well as different socio-economic segments of the population. The research reported in this paper makes use of the outcome of an earlier developed GIS model built for analysing the inherent quality of public GS [41] and proximity (accessibility) of public GS [25] from existing GIS data. The model is used in several ways: (a) the indicators are used for designing scenarios and strategies for public GS development for Brussels in RbD workshops and in additional RbD by the authors; (b) analysis of these scenarios (whether for single public GS or for the whole study area) is done through spatial and numerical comparison of the indicator scores; (c) this allows the formulation of design strategies and approaches for public GS development, as well as policy recommendations. The research presented is novel in its combination of three aspects: (a) high-resolution proximity indicators, calculated at the urban block level, using path network distances; (b) in-depth collaborative RbD exercises on opportunities for GS development; and (c) scenario-based impact analysis in relation to socio-economic indicators.

2. Materials and Methods

2.1. Concepts

The methodology involves concepts that are explained more in-depth first. The *proximity model* is the GIS-based model that was developed by the authors [25] for producing indicators for proximity of green spaces on different *Theoretical Functional Levels* (TFL). The notion of TFL relates the distance to GS that a resident is willing to cover to the size of the GS. The rationale behind this approach is that the size of a GS determines the range of functions or activities the GS may potentially support. It is assumed that residents will be prepared to cover longer distances to reach a larger GS, because of its improved offer in terms of amenities, potential uses, and benefits [25]. This idea is supported by several empirical studies [19,42]. In the proximity model used in this study, seven theoretical functional levels (TFL) are defined, from the residential to the metropolitan scale, each corresponding with a minimum size and maximum distance, the latter obtained empirically (Table 2, Figure 1). *Design* is used in this study to test possibilities for creating GS and for testing these propositions against the multiple preconditions concerning development of GS. GS that are proposed on suited locations as a solution for the lack of GS on a specific TFL are named *Opportunities for Green Space Development* (OGSD). When a specific set of OGSD is chosen for impact analysis, it is called a *scenario.*

Table 2. Theoretical functional levels (TFL) with values used for the proximity modelling.

TFL	Min. Surface (ha)	Max. Distance from Home (m)
Metropolitan green space	450	5900
City green space	70	2700
District green space	15	1400
Quarter green space	6	1000
Neighbourhood green space	2	600
Play green space	0.5	350
Residential green space	0.1	150

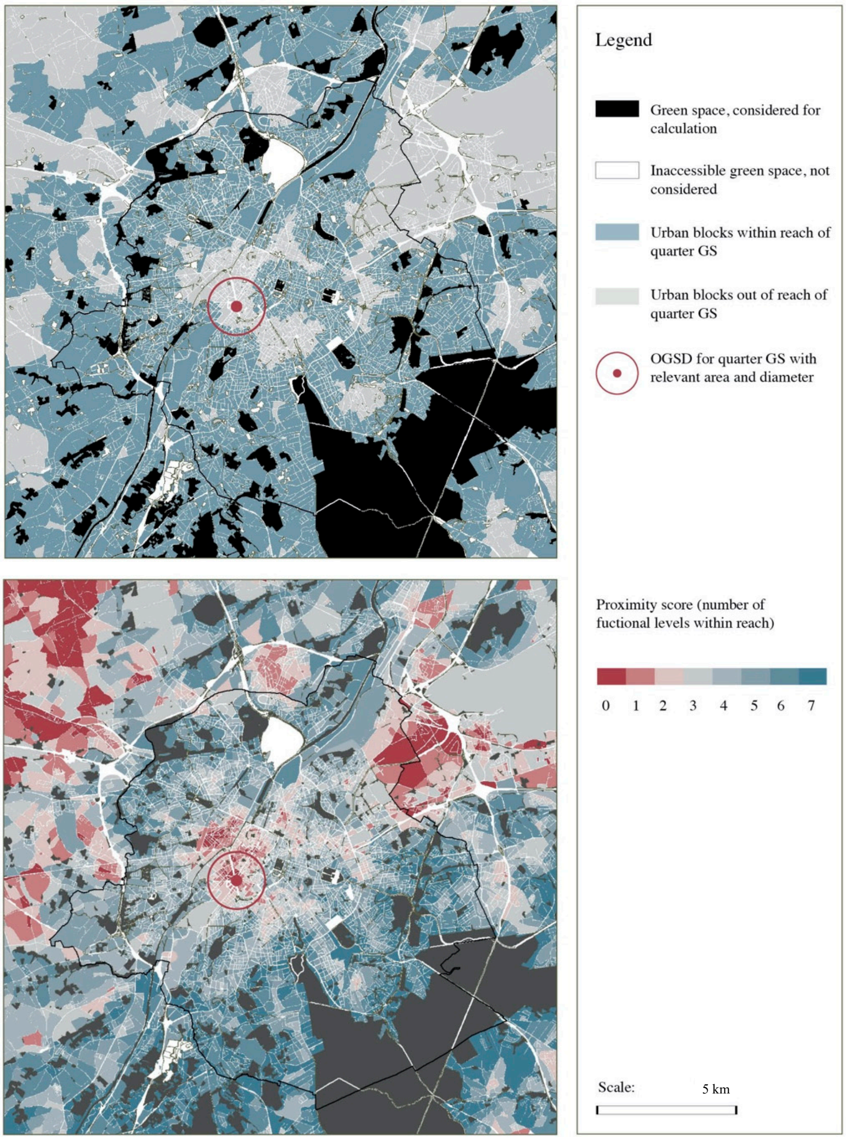

Figure 1. Urban blocks within reach of quarter green space (**top**) and proximity score of urban blocks (**bottom**).

2.2. Materials

GS proximity is modelled according to the procedure described in Stessens, Khan, Huysmans and Canters [25] and its standards. A visual representation of the existing public GS and TFL Spatial indicators/maps produced by the model are calculated at the level of urban blocks and include identification of all urban blocks having a specific level of GS within reach (Table 2, Figure 2, top), as well as an overall proximity score ranging from 0–7, indicating for each urban block how many of the seven TFL are accessible (Figure 2, bottom). It is important to note that functional levels form a hierarchy, where it is assumed that higher-level GS also offer the functions of lower-level GS. For example, district GS are also considered in the calculation of access to neighbourhood green, applying the maximum distance threshold for the latter. For the design exercises, the proximity indicator maps (model output) were complemented with an aerial image of Brussels at 25 cm resolution. Additional layers that were used for location finding of new GS are: a base map including buildings, parcel boundaries, and existing GS (Figure 1), the public transport network (rail, metro, tram), surface water (streams and water bodies), protected landscapes and nature reserves, a noise map (road, rail, and air traffic), and the biological valuation map (Table 3).

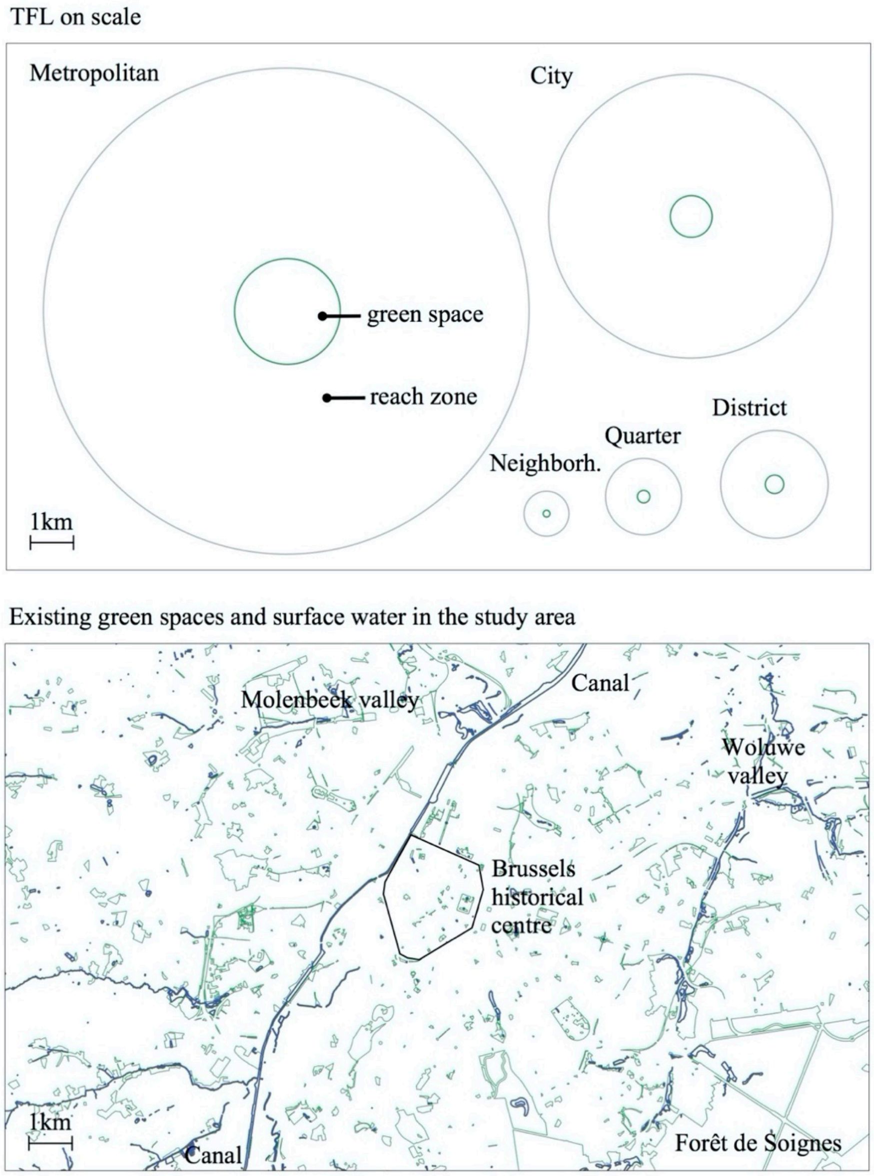

Figure 2. Minimum TFL areas plotted as circles and outlines in the study area on the same scale. ↑ North.

Table 3. Maps used for the design exercises and scenario development (all are in vector format, except for (*), which are in raster format).

TYPE	Name	Source
Proximity indicator	Reach of residential GS	PM
Proximity indicator	Reach of play GS	PM
Proximity indicator	Reach of neighbourhood GS	PM
Proximity indicator	Reach of quarter GS	PM
Proximity indicator	Reach of district GS	PM
Proximity indicator	Reach of city GS	PM
Proximity indicator	Reach of metropolitan GS	PM
Proximity indicator	Proximity score	PM
Aerial image	Orthophotos, medium-res 25 cm, colour, Vlaams-Brabant, 2012 *	IV
Forests	Bos	IV
	UrbMap_GB_F	URBIS
Habitat zones	Habrl	IV
	Natura2000_station	BE
Parks	LandUse_lam72 (NSN)	IV
	Urbmap_GB_B	URBIS
Water bodies	Wtz20001R500	IV
	UrbMap_WB_0	URBIS
Biologically valuable	BWK2	IV
Protected landscapes	Bslastdo	IV
Additional (roadside green)	UrbMap_GB_A	URBIS
Urban blocks	UrbMap_Bl	URBIS
Parcels	GRBgis Adp	IV
	UrbIS P&B	URBIS
Noise maps	geluidscontouren_ spoorwegen_Lden	LNE
	geluidscontouren_ wegen_alles_Lden	LNE
	Geluidskaart_5 m *	IBGE
Mean income	Gemiddeld belastbaar incomen per inwoner (neihborhood scale)	WM
Population density	Bevolkingsdichtheid (neighbourhood scale)	WM
PM (proximity model)	Stessens, Khan, Huysmans, and Canters [25]	
IV (Informatie Vlaanderen)	https://download.agiv.be (accessed on 1 October 2016)	
URBIS (Brussels Urban Information System)	http://cibg.brussels/nl/onze-oplossingen/urbis-solutions/download (accessed on 1 October 2016)	
BE (Brussels Environment)	http://wfs.ibgebim.be/ (accessed on 1 October 2016)	
LNE (Env. department of the Flemish Region)	https://www.mercator.vlaanderen.be/zoekdienstenmercatorpubliek/ (accessed on 1 October 2016)	
WM (wijkmonitoring)	https://wijkmonitoring.brussels (accessed on 1 May 2019)	

2.3. Main Methodology

Table 4 provides an overview of the different steps in the methodology and the materials used in each step. The RbD was performed in two parts: (i) during an interdisciplinary workshop (Figure 3) with twelve participants, including researchers (e.g., architects and urban designers, planners, hydrologists, geographers), students in architecture and urban design, people from the regional office for environment, and regular citizens—here, proximity maps per TFL were projected on whiteboard for drawing GS development scenarios; (ii) during a smaller session (one researcher and one student) on GIS analysis, for processing the workshop outputs, and for additional scenario work. Complex solutions were further tested in AutoCAD. Based on the interventions needed for the realisation of the green space, OGSD were classified according to investment scale, from regular investment to high additional costs. The development options include both traditional GS planning options and more intricate options that can be considered in case a traditional solution is not spatially possible. One of the goals of the exercise is to explore which degree of complexity of solutions is needed to provide sufficient green space accessibility in the most challenging areas. The spatial as well as demographic impact was then assessed for the whole study area as well as for two socio-economic groups in the BCR.

Figure 3. Pictures of the collaborative RbD workshop. **Top**: plenary session and discussion; **middle**: joint sketching session of OGSD on projected media (output of proximity modelling); **bottom**: detailed design of one case study for expansion and improvement of an existing park.

Table 4. Methodological steps and materials used.

Actions	Tools
Identifying problem and/or priority areas (low number of TFL within reach)	• Proximity score
Identifying opportunities for green space enlargement and locations for new green spaces through collaborative RbD. Methods: • Projected maps on whiteboard, drawing and discussing potential interventions for each TFL • Listing interventions and approaches per TFL	• Proximity indicator per TFL • Proximity criteria: area; user distance threshold • Base map: e.g., property boundaries; buildings; existing green spaces • Aerial image
Identifying opportunities for green space enlargement and locations for new green spaces through individual RbD. Methods: • Visual identification of possible locations through map overlay with a theoretical public GS (circle with radius $r_{PGS} = \sqrt{A_{TFL}/\pi}$ and a circle with its attraction radius $r_{ATT} = r_{PGS} + \left(\sqrt{2}/2\right).d_{TFL}$ (where the maximum distance d_{TFL} is adjusted to the road network) • Testing of interventions through CAD- or GIS-based design of green space configurations and adjustments to the surroundings (e.g., road network, property limits) • Listing in detail the types of interventions needed for expanding or creating the public GS	• Proximity indicator per TFL • Proximity criteria: area; user distance threshold • Base map: e.g., property boundaries; buildings; existing green spaces • Aerial image • Public transport network • Surface water • Protected landscapes • Nature reserves • Noise map • Biological valuation map
Identifying types of GS development and developing scenarios • Sorting green spaces according to types/typologies of combined intervention types per TFL • Determining investment class (simplified) of intervention types • Classifying proposed public GS into investment class and scenarios (low/mid/high investment)	• List of proposed public GS
Impact analysis • Running the model with scenarios • Analysing the impact of scenarios on population (How many people have access to how many functional levels? How does this improve with each scenario in relation to existing conditions?)	• Map of proposed public GS per scenario • Proximity model • Population map

2.4. Collaborative RbD Workshop

In the workshop, the study area was explored for public GS optimisation possibilities with the help of the output of the proximity model (Figure 2). Maps depicting the accessibility of each separate TFL were used for identifying opportunities/options for green space development (OGSD). OGSD comprise all viable options to develop public GS or to expand an existing public GS. They are outlined by a perimeter and involve spatial interventions. All interventions necessary for the OGSD to be feasible were then determined and listed. To determine the relevant interventions, rudimentary design exercises were made, such as drawing the perimeter on aerial imagery, overlay with other maps, or more detailed design exercises in case of complex potential public GS.

2.5. Individual RbD

Four questions are explored: (i) whether the study area can be fully served at all TFL; whether 'standard' approaches exist for GS development and how these differ for each TFL; which scenarios can be formulated based on the design exploration; and how do these scenarios relate to the earlier described correlation with socio-economic indicators?

3. Results

First, inequalities in the provision of GS in the BCR are briefly discussed, focusing on the proximity of GS of different functional levels. Next, the results of the RbD exercises for the improvement of GS proximity are discussed per TFL, and distinctive types and opportunities of GS creation are identified. In the last part, these OGSD are incorporated in three different scenarios, depending on how (financially) challenging different types of interventions are. In the scenario analysis, GS proximity for the poorest 25% of neighbourhoods is compared with scenario outcomes for other neighbourhoods.

3.1. Inequalities in Green Space Provision

As Figure 4 shows, green proximity scores, expressing the diversity of TFL within reach of each urban block, are generally higher in the periphery of the BCR than in the central parts of the city. Weighting the lack of GS (reversed proximity score multiplied with the population density) highlights the lack of GS in the densely populated 19th century belt around the centre of the BCR (Figure 5). Figures 6 and 7 show the urban blocks within reach of a certain TFL of GS, and therefore also the gaps where GS of the specific TFL should ideally be provided. Whereas the gaps in residential and play GS proximity are quite fragmented, in the higher TFL, clear zones start to appear, with a consistent lack in the historical centre up to district GS and a north-south partitioning for city and metropolitan GS.

3.2. Research by Design on Improvement of Public GS Proximity

In the design workshops, by means of the GS proximity indicators per functional level (Figures 6 and 7), 162 OGSD were identified for the whole study area (Tables 5–7, Figure 8, Tables A1–A5 in Appendix A) relating to the TFLs neighbourhood GS (level 3) to metropolitan GS (level 7). These OGSD were defined with the goal of increasing the amount of people within reach of a TFL with a minimum of interventions. By solving higher TFL first, starting with metropolitan GS, some OGSD could be considered redundant in lower levels, as they were already covered by the proposed GS on a higher level. For example, when introducing a metropolitan structure in the west of Brussels with a reach of 5900 m, an outward buffer zone of 707 m (theoretical displacement of 1000 m distance reach of district GS, see: displacement, Table 7) was taken into account. Here, in this area, the introduced metropolitan GS already covered the district GS proximity. The proposed OGSD are visualised relative to existing green spaces in Figure 8. For the study area as whole, the levels residential GS (level 1) and play GS (level 2) would potentially result in a very high amount of OGSD, and determining these is out of the scope of this work. Therefore, for these levels, a focus area was selected (Figure 8, dashed line), in which 42 OGSD were defined. In total, 53 types of interventions needed for the realisation of the proposed OGSD were identified (Tables 5 and 6). For quarter green (level 4) up till metropolitan green (level 7), OGSD can be grouped into types according to recurring interventions (Table 5). For residential (level 1) up to neighbourhood green (level 3), interventions proposed are limited, so OGSD types are self-explanatory, referring to a particular type of intervention. Interventions proposed for all OGSD are listed in Appendix A (Tables A1–A5). The following sections provide a description of common and specific interventions related to the different types of OGSD.

Figure 4. Proximity score at urban block level (dark 0–7 light). Lines: Brussels-Capital Region (thick) and the 19 municipalities it is composed of (thin) ↑ North—Scale: ▭ 5 km.

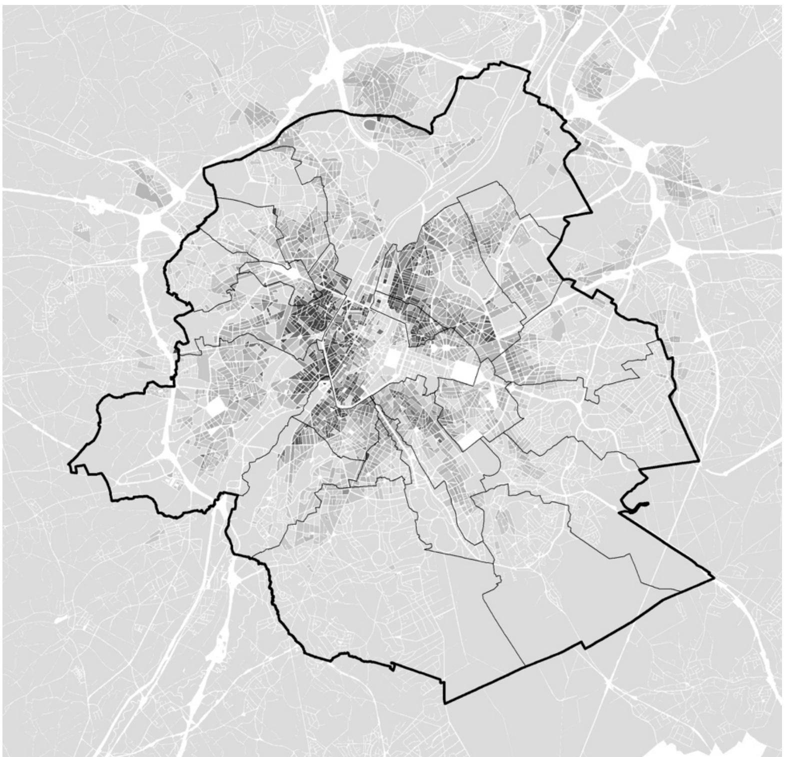

Figure 5. Impact of lack of green space proximity (population weighted). Light: low impact; dark: high impact (i.e., low proximity scores in densely populated areas). Lines: Brussels-Capital Region (thick) and the 19 municipalities it is composed of (thin) ↑ North—Scale: ▭ 5 km.

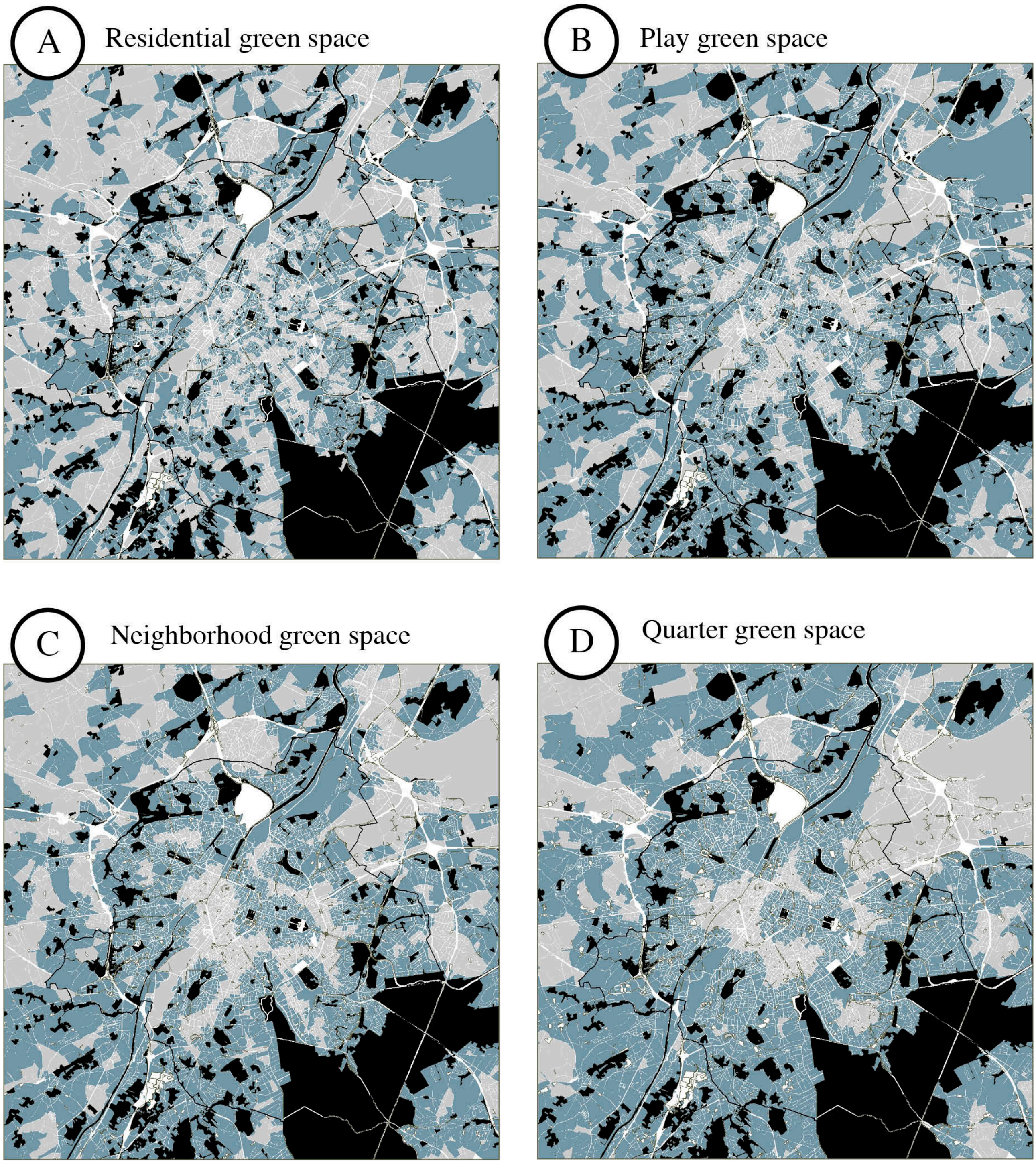

Figure 6. Urban blocks within reach of seven levels of public green space (continues on the next page, including legend). Residential green space (**A**), play green space (**B**), neighborhood green space (**C**) and quarter green space (**D**).

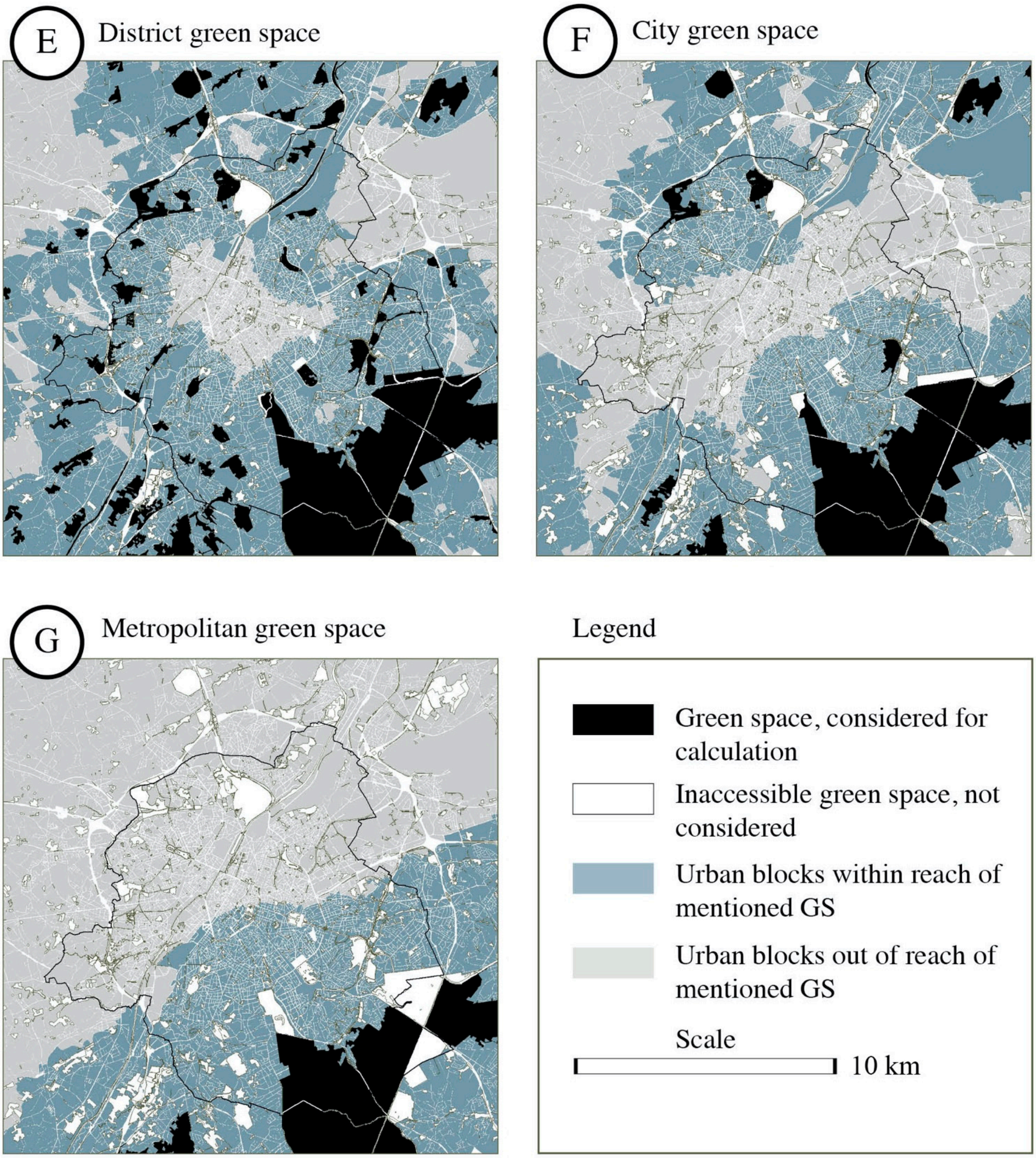

Figure 7. Urban blocks within reach of seven levels of public green space (continuation of the previous page). ↑ North. District green space (**E**), city green space (**F**) and metropolitan green space (**G**).

Table 5. Number of and parameters related to proposed green spaces.

Theoretical Functional Level (TFL)	Min. Surface [1] A (ha)	Max. Distance from Home [1] d (m)	Max. Displacement [2] Δ (m)	Number of Proposed Green Spaces
Metropolitan green space	450	5900	4172	10
City green space	70	2700	1909	12
District green space	15	1400	990	38
Quarter green space	6	1000	707	19
Neighbourhood green space	2	600	424	62
Play green space [3]	0.5	350	247	8
Residential green space [3]	0.1	150	106	13

[1] As proposed in Stessens, Khan, Huysmans and Canters [25]. [2] Considering smallest displacement (71% of ground distance), taxicab geometry [43]. [3] The search perimeter is restricted to a focus area as indicated in Figure 8.

Table 6. Types of GS development options (TFL residential-neighbourhood excluded as these are self-explanatory, as they are related to one intervention).

N°	GS Development Option Types	Intra-Urban Metropolitan GS	Peri-Urban Metropolitan GS	Rural Metropolitan GS	Valley Parks	Agriculture Reconversions to Valley Parks	Agriculture Reconversions	Urban Space Optimisation	Functional Level Scaling	Inner City District GS Optimisation	Inner City Continuous Spaces	Peri-Urban District GS Development	Publicly Accessible Estates	Rural District GS	District GS Dev. in Tributary Valleys	Expanding Park	Conversion/Reorganisation	Commercial Green Roof	Conversion/Reorganisation of Park Space
	TFL	Metr	Metr	Metr	City	City	City	City	Distr	Distr	Distr	Distr	Distr	Distr	Distr	Quart	Quart	Quart	Quart
N°	**Interventions**																		
1	Developing wetlands in valley bottom	x	x		x	x									x				
2	Developing a blue-green network	x	x	x	x	x									x				
3	Deploying walking, cycling trajectories	x	x	x	x	x	x												
4	Converting agricultural fields to park space with small-scale agricult. character	x	x	x		x	x					x		x					x
5	Dev. green around upstream tributaries			x			x					x							
6	Cutting local road	x	x	x		x		x			x	x					x		
7	Connecting existing public green spaces	x	x	x	x	x		x								x			
8	Halting housing development		x	x															
9	Reversing housing development			x															
10	Noise shielding	x	x	x								x							
11	Integrating protected landscapes	x	x	x								x	x						
12	Integrating estates												x						
13	Connecting over 4-lane road	x																	
14	Connecting to railway station	x						x											
15	Covering open railroad trenches							x											
16	Connecting to tram station	x						x			x					x			
17	Extending park over local road										x								
18	Re-routing roads away from park										x								
19	Putting through traffic underground									x						x			
20	Transforming urban blvd. to park strip																		
21	Greening tram beds crossing the GS								x										
22	Cutting park drives for cars								x										
23	Connecting to metro station								x							x			
24	Re-integrating derelict land								x										
25	Developing real estate around GS																x		
26	Reorganizing open-air sports facilities																x		
27	Making impervious surfaces pervious										x							x	
28	Roof park extension on comm. buildings																	x	
29	Roof park extension on public buildings																	x	
...	...																		

Table 7. Interventions not related to specific GS typologies.

N°	Interventions	Share in 162 OGSD
...		
30	Transforming local road into GS	8%
31	Moving logistic activities and light industry	6%
32	Transformation public space into park	5%
33	Activation of unused lawns	5%
34	Connecting over/under local road	4%
35	Part of private garden to park space	4%
36	Cutting parking spaces	4%
37	Rooftop park on top of industrial building	4%
38	Making fenced off grounds accessible integrating sports grounds	3%
39	Creating passages in-between buildings	3%
40	Connecting to highway	2%
41	Visual shielding	2%
42	Connecting nearby housing projects with park space	2%
43	GS in shared use with public services	2%
44	Converting parking space into GS	2%
45	Renegotiating industrial land for shared use	2%
46	Mega-roundabout	2%
47	Integrating nature reserves	1%
48	Connecting over causeway	1%
49	GS as part of strategic site redevelopment	1%
50	Connecting over water body	1%
51	Demolishing existing building for creation of GS	1%
52	Connecting separate parts over highway	1%
53	Reversing commercial building	1%

3.3. *Three Scenarios of PUBLIC GS Development*

Three scenarios were created by selecting a subset of OGSD that were identified earlier in the process: basic investment (BASE); supplementary investment (SUPP); and full investment (FULL) (Table 8, detailed listing in Appendix A, spatial representation in Figure 8). Most OGSD require an additional investment apart from regular construction costs for public GS. The investment class of an OGSD determines in which scenario it is included. The classification is approximate due to the absence of detailed cost estimates, though sufficiently discriminating for its purposes, which is to define three public GS development scenarios based on approximate investment. The following cost-increasing actions were considered for the scenario classification: tunnel construction or similar works; above-ground infrastructure works; compulsory residential real estate acquisition; compulsory industrial/logistic real estate acquisition; altering public facilities; agricultural land acquisition; and installing noise barriers.

Table 8. Number of OGSD per scenario per functional level of the proposed GS.

Scenario	BASE	SUPP	FULL
All	79	127	140
Metropolitan GS	2	(2) + 6	(2 + 6) + 2
City GS	5	(5) + 5	(5 + 5) + 1
District GS	26	(26) + 7	(26 + 7) + 5
Quarter GS	12	(12) + 5	(12 + 5) + 2
Neighbourh. GS	39	(39) + 20	(39 + 20) + 3
Play GS *	0	0	0
Residential GS *	0	0	0

* Focus area OGSD not included.

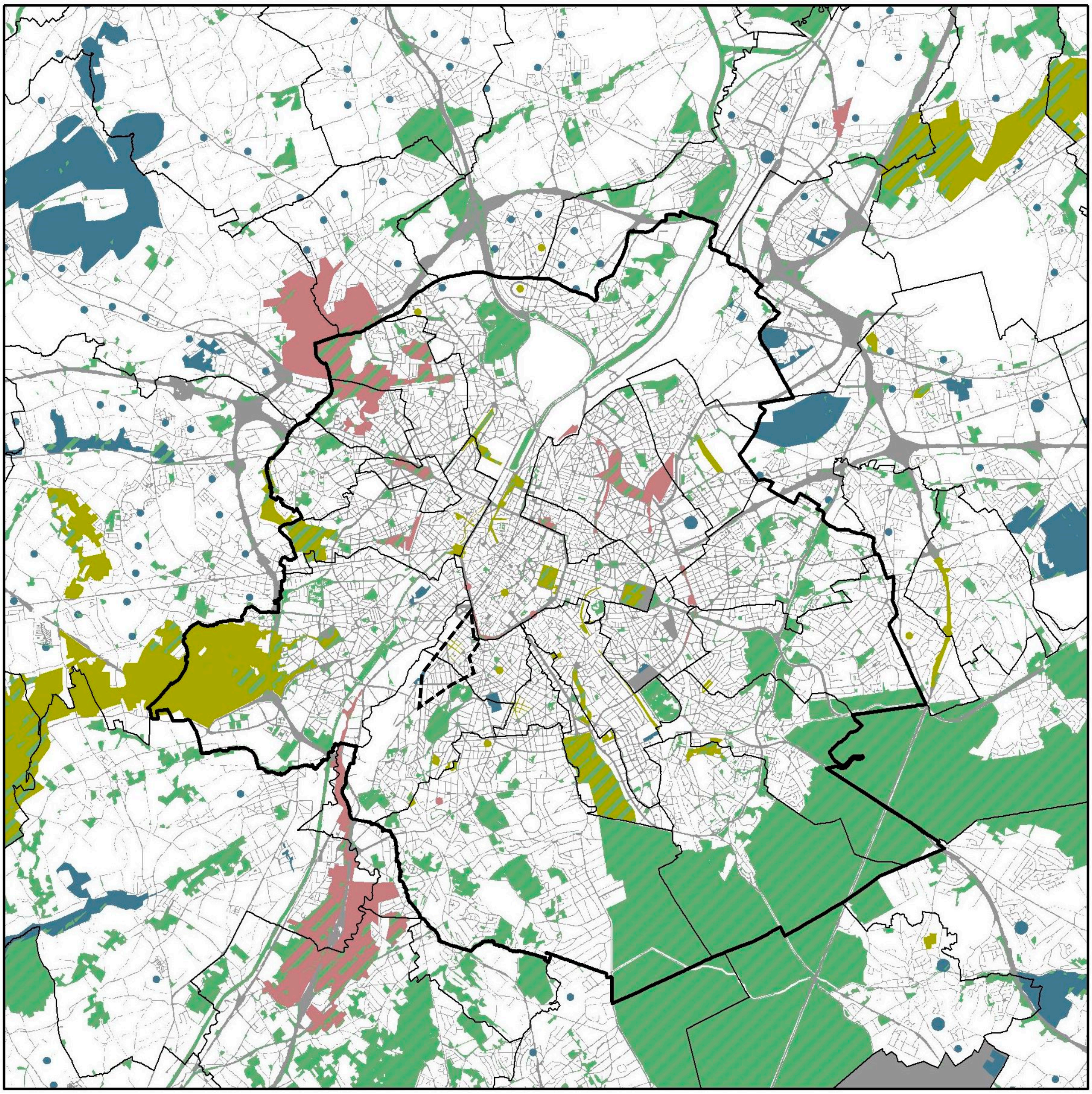

Figure 8. Existing public GS (green) and proposed public GS (blue: low investment; yellow: medium investment; red: high investment). Hatched GS are reconversions or expansions of existing GS. Dots are indications of green spaces without their actual shape. The size of the dot represents its actual TFL area, which has been verified visually to fit in the landscape. Thick line: Regional border Brussels–Flanders, thin line: city borders, dashed line: focal area for residential and play GS OGSD. ↑ North—Scale: 5 km.

In the design exercises, the low-cost OGSD (suited for the BASE scenario) were given priority when deciding on locations for public GS development in the scenarios. An optimal allocation was pursued to introduce a minimum of OGSD for a maximum improvement of GS accessibility for each functional level. With these preconditions, for the FULL scenario where a maximum coverage is attempted, at least 43% of the proposed public GS are not low cost.

The current state of GS proximity is described in detail in Stessens, Khan, Huysmans and Canters [25]. To summarise, there is a strong lack of public GS in the area including East Molenbeek and the west of central Brussels (area marked as A in Figure 9) and to a lesser extent in Sint-Joost-Ten-Node (Figure 9B) and the Hallepoort-Louise-Matongé area

(Figure 9C). A few patterns are the cause of this: (i) district GS is not present in the central parts of the BCR; (ii) city GS only occurs along the northwest and southeast border of the BCR, resulting in a southwest-northeast oriented axis with reduced accessibility to higher-level green spaces; and (iii) metropolitan GS is absent in the north, leaving the northern part of the BCR underserved [25]. Residential GS and play GS have more irregular patterns of coverage, yet are less well represented in dense urban areas, which in combination with the lack of other TFL reinforces the occurrence of problem areas. Results reveal that even though it is difficult to reach a good green space provision for poor neighbourhoods, it is not impossible within the current urban fabric of Brussels.

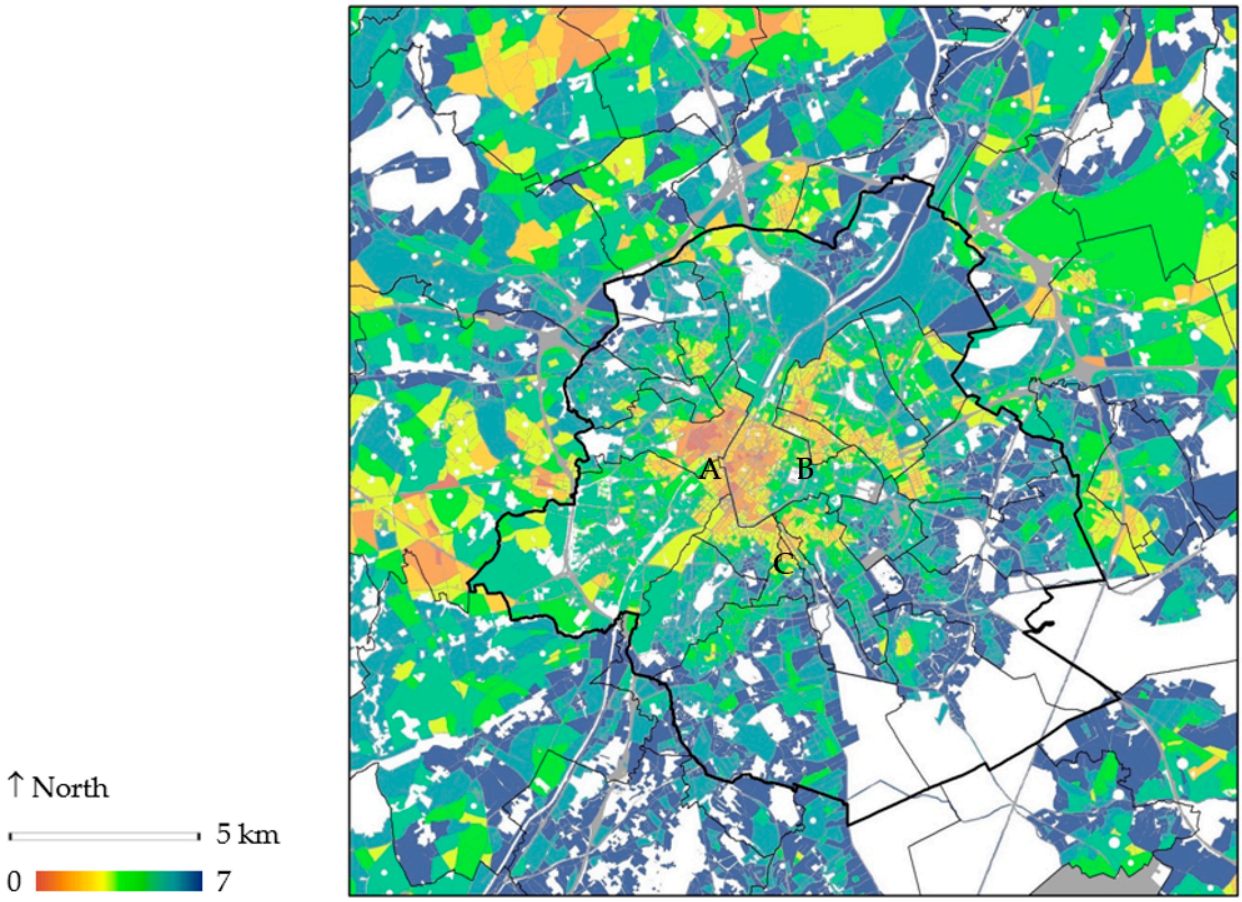

Figure 9. Number of TFL within range in scenario BASE.

The BASE scenario mostly resolves the lack of public GS in the periphery, though very little in the BCR itself (Figure 9). This is mainly due to the open space scarcity in the highly urbanised BCR implying more costly solutions. The SUPP scenario significantly improves the lack of public GS in East Molenbeek as well as west of central Brussels but does not fully solve the lack of GS in the Hallepoort area and Sint-Joost-Ten-Node and leaves Schaarbeek with a low proximity score (Figure 10). The FULL scenario solves the lack of GS proximity by bringing most urban blocks to a score 4–5 (Figure 11). Some of the peripheral agricultural areas keep low values, which is mainly due to the large units of land. This increases the average distance between the perimeter of the urban block and public GS. A reiteration of public GS placement or creating a finer path network could solve this issue. The average proximity score is 3.1 for CURR, 3.5 for BASE, 4.3 for SUPP, and 4.7 for FULL.

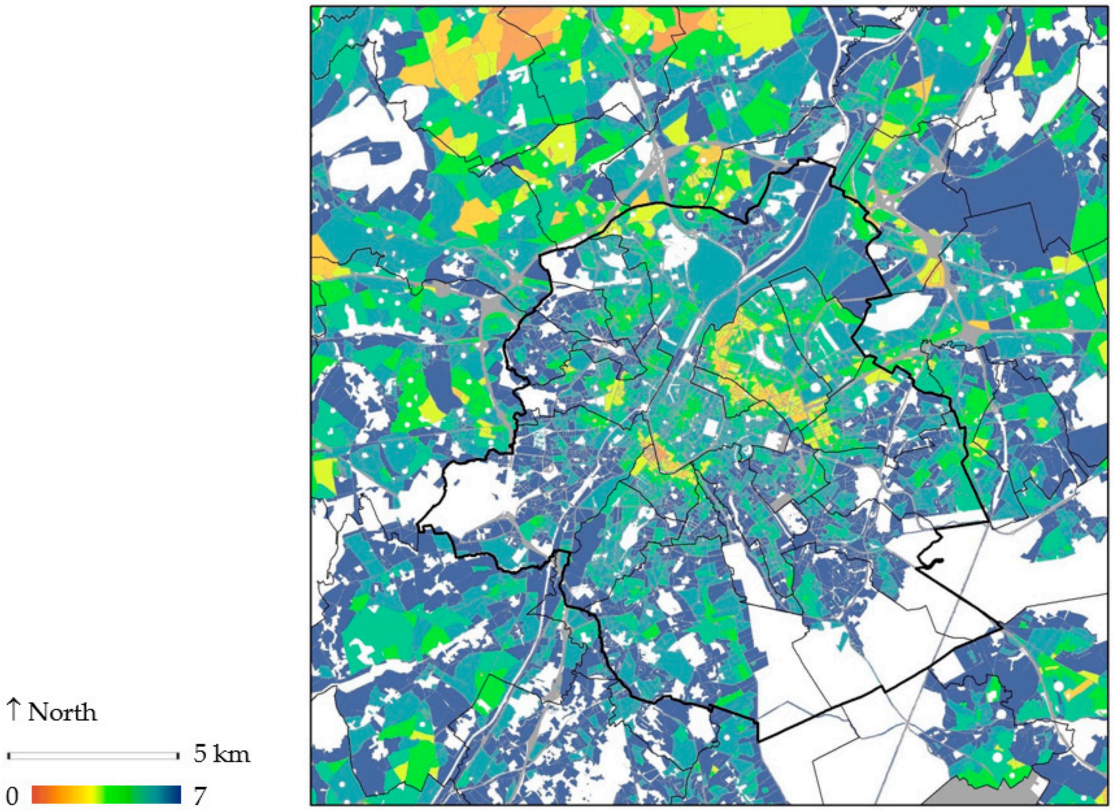

Figure 10. Number of TFL within range for scenario SUPP.

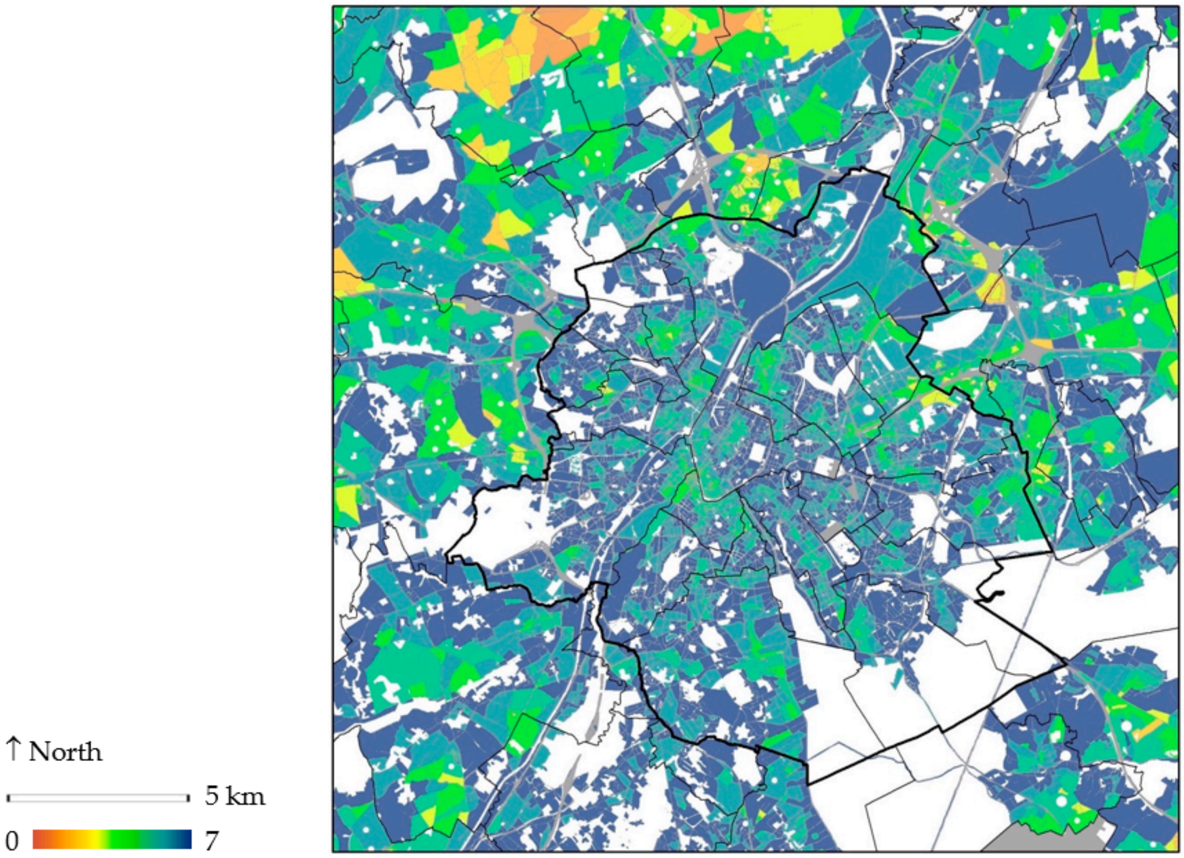

Figure 11. Number of TFL within range for scenario FULL. 0 7.

Figure 12 depicts the population share per proximity score (the amount of different TFL within reach). Since proximity to residential GS and play GS are not considered in the scenarios, the proximity score can be maximum 5 instead of 7. Ideally, the population share is 100% for proximity score 5 and 0% for 0–4. The existing state CURR shows a large margin for improvement in the range 4–5. Around 1/5th of the population has a proximity score of only 1–2, and nearly 1/10th of the population has no neighbourhood GS or larger within reach. Whereas the BASE scenario gives the impression of significant change when observing the maps, in terms of population impact there is only a slight change of around 10% increase for proximity scores 4–5 and around 5% decrease in the proximity scores 0–3. The scenario halves the population with proximity score 0 but leaves about 5% of the population with no neighbourhood GS or larger public GS within reach. The population with proximity scores 0–2 lowers from 30% to 19%; however, it requires the SUPP scenario to make this segment drop below 6%. In this scenario, changes become clear, as the population share with full access to higher-level GS (proximity score 5) reaches 53%, while the population with no access to public GS of neighbourhood level or larger drops to 0%. In the FULL scenario, 78% of the population has a proximity score of 5 and 99% has a score of 3 or higher. The centre–periphery contrast disappears, and the BCR achieves a balanced, high-quality provision of public GS.

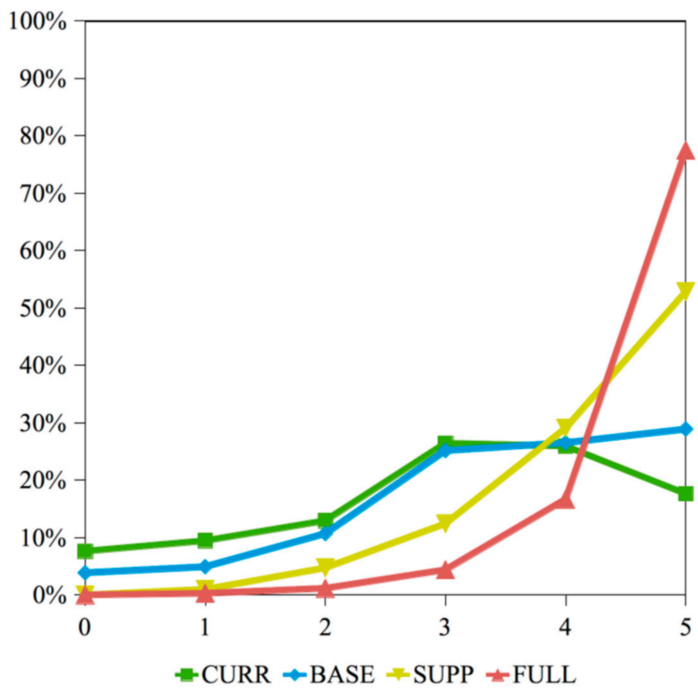

Figure 12. Share of population that has 1–5 TFL of public green space within range for CURR and scenarios BASE, SUPP, FULL.

As explained before, design interventions for residential GS and play GS have not been tested for the full study area due to the large number of potential interventions. One of the most challenging test areas was selected for a design exercise, based on the lack of such public GS, low income, and high imperviousness. Despite these challenges for the test area, the OGSD that have been identified appeared to be sufficient to cover the lack of these small public GS. The higher-than-normal investment costs related to, for example, developing public intensive green roofs, parks in urban block interiors, or car-free street and boulevard transformations make these OGSD not feasible within the BASE scenario. During the workshop, a discussion about the practical implications of green space development, experts, and designers agreed that these spaces do not only require elaborate spatial design, but also innovation related to the stakeholder process, legislation, and management. Examples are the management and insurance responsibilities for rooftop parks, the controversial aspect of making streets (partly) car-free, the high number of landowners involved for implementing urban block interior parks and the access management, the high number of stakeholders for street transformation, and consultation with fire departments and other emergency services and their willingness to change or co-create guidelines for unprecedented spatial configurations.

3.4. Inequalities in Green Space Proximity under Different Scenarios

Figure 13 shows the spatial distribution of urban blocks located within low versus medium-to-high average incomes for the BCR. The focus is on the BCR only, given its high population density and public GS demand. The selected urban blocks form an almost contiguous area along the canal zone. Urban blocks are split into two categories: those located within the 25% statistical sectors with the lowest average reported income (BOT25), and those located within statistical sectors where the average reported income is higher (TOP75).

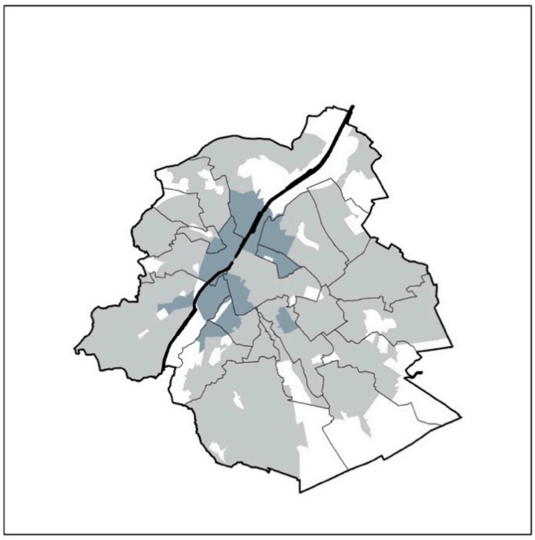

Figure 13. Urban blocks in neighbourhoods with TOP75 (grey) and BOT25 (blue) average incomes; the Brussels Canal is shown in black. No data is shown in scarcely populated statistical sectors (white). Scale: 5 km.

In Figure 14, the influence of income on public GS accessibility is shown for the current situation, along with the potential of the three scenarios for improving access to public GS in low-income vs. medium-to-high-income neighbourhoods. For each category, the population percentage with GS of different TFL within reach is shown for the current state (CURR) and for each of the three scenarios (BASE, SUPP, FULL). The lowest TFL residential GS and play GS, for which no interventions are proposed in the scenarios, show an increase in reached population due to the fact that higher TFL are considered as covering the functions of lower TFL if they are within reach [19,25]. In the current state (CURR), metropolitan GS, city GS, and residential GS are the lowest-performing TFL region-wide with, respectively, 42%, 52%, and 55% of the population within reach. However, it is possible to elevate the reach of the five highest TFL to a very high level in the FULL scenario. In CURR, the average accessibility for all TFL for the BOT25 group in terms of fraction of the people reached is about 40% lower than for the TOP75 group (Figure 15), meaning that inhabitants living in the lowest-income neighbourhoods are strongly disadvantaged in terms of public GS access. Access is especially low for the BOT25 group for city and metropolitan GS (Figure 14). The BASE scenario has nearly no impact (3%) in terms of improving people's access to GS overall. The SUPP scenario, on the other hand, leads to a substantial increase in accessibility for the five highest-level TFL, especially for BOT25 neighbourhoods, where the scenario impact is much higher than for the TOP75 group (Figure 16). In addition, for the FULL scenario the gain is higher for the disadvantaged BOT25 group than for the TOP75 group, restoring the balance for both groups in terms of access to GS for most TFL. Only city green and residential public GS access remains lower for BOT25 than for TOP75 (Figure 16).

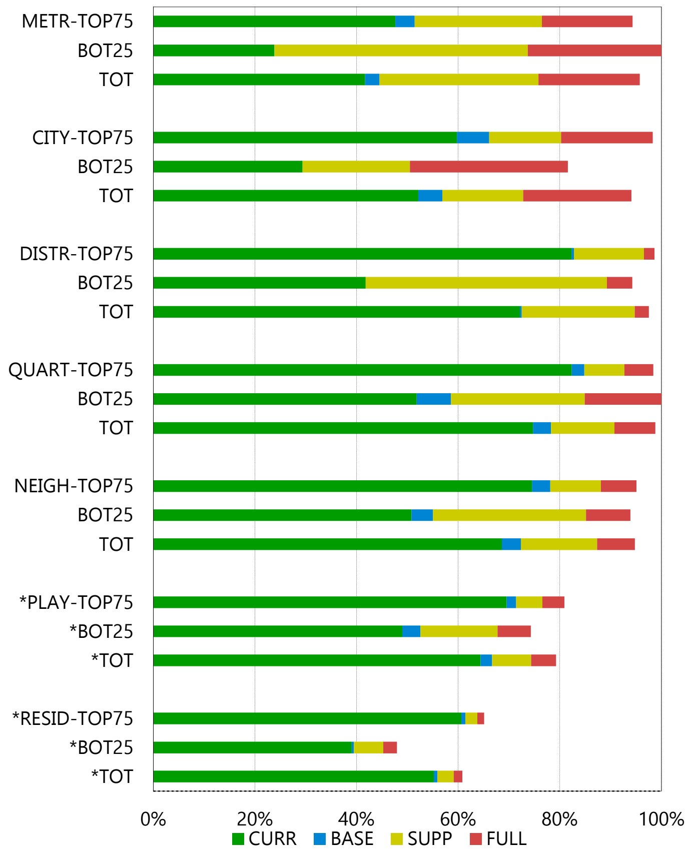

Figure 14. Percentage of population in low- and in medium-to-high-income neighbourhoods (BOT25, TOP75) and in the entire BCR (TOT) having access to each TFL in each scenario.

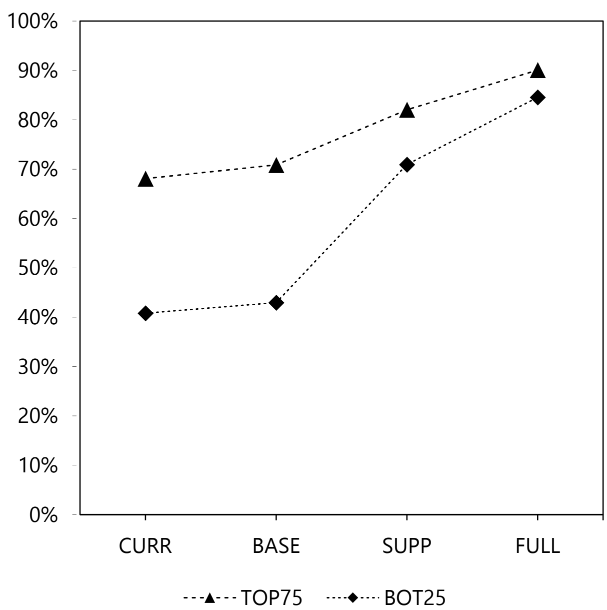

Figure 15. Average fraction of people reached for all TFL in each scenario for low-income (BOT25) and for medium-to-high-income groups (TOP75).

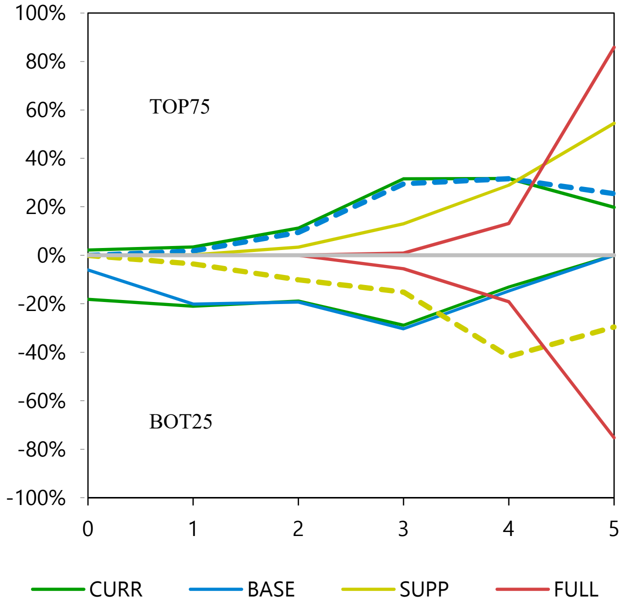

Figure 16. Population share per proximity score (0–5) for low-income (BOT25) and for medium-to-high-income groups (TOP75).

Figure 16 shows the population share per proximity score per scenario for the five highest-level TFL for both population groups. The disadvantage of the BOT25 group is clearly visible for CURR and for the BASE scenario. The results show a higher FULL scenario potential for the TOP75 group, as well as some similarity of potential between the TOP75-BASE scenario and the BOT25-SUPP scenario. Therefore, in case an equitable public GS development is the priority, public GS development goals and investment levels might be differentiated as such, to generate similar public GS provision for low-income neighbourhoods and medium-to-high-income neighbourhoods.

4. Discussion

The RbD experiment shows the potential of the TFL proximity model that was developed by the authors [25], and its indicators, as a design and decision making tool. It allows the identification of problem areas. The output of the model helps in determining possible locations and interventions and allows measurement of the impact of proposed solutions on citizens' access to public GS. Design exercises have shown the possibility for the BCR of moving away from a public GS status quo and reducing inequalities in public GS provision. The question of whether the solutions proposed are financially realistic is not addressed in this paper; however, the relation between approximated level of investment, its effect, and how to prioritise has been explored by means of scenarios.

Scenario definition in this study was limited to larger-size green spaces, from metropolitan to neighbourhood green. In further studies, the feasibility and typologies of OGSD at the level of residential and play green can be further elaborated, though exploration of RbD interventions in a focus area has shown the potential of a high level of GS provision for small public green spaces despite high built-up densities. Different types of OGSD can be defined for each TFL, corresponding to a range of interventions, sometimes unique to the TFL, sometimes spanning over several TFL. Identifying these types can contribute to the streamlining of identifying suitable locations for their realisation in the form of actual projects.

The three scenarios developed for the BCR show the negligible contribution of low-investment developments in the BASE scenario and the necessity of multidisciplinary, higher-investment GS development on challenging sites (SUPP/FULL scenarios). With regards to scenario implementation, mainly the interaction with traffic infrastructure poses an implementation challenge; however, it can also act as a catalyst to move towards more sustainable mobility. The design exercises point to the necessity of infrastructure adaptations that reorganise or lessen traffic flow and of the acquisition of empty (parts of) residential plots in favour of the GS. In accordance with other studies, design exercises showed a range of possibilities in adaptive use of sub-optimal or vacant urban infrastructure, brownfields, and gap sites [39,44,45], or gap space on occupied sites, as well as in covering of rail corridors and development of intensive green roofs adjacent to public green spaces.

Monitoring evolutions in the proximity score for different scenarios, thereby differentiating between various income groups (Figure 14), may be especially useful for setting policy priorities and for monitoring the balance between income groups in terms of access to a range of GS with different functionalities. However, there is a paradoxical aspect to the development of equity in access to GS. The inhabitants of neighbourhoods that are made healthier and more attractive through new or improved GS development are often confronted with gentrification caused by increasing property value [33,46], a process commonly referred to as environmental gentrification [47]. As such, policies and interventions can miss the intended receivers of benefits. Decision-makers, planners, and designers should therefore make cities and neighbourhoods 'just green enough' [33]. GS development has to be planned in an orchestrated way throughout the city for minimal gentrification effects, or GS development must be paired with strategies that prevent negative gentrification impacts, for example, careful urban renewal (behutsame Statdterneuerung) for the preservation of the social composition of the population [48]. Strategies include: an encouragement of citizens' participation, transfer of land to public re-developers (right of first purchase and first refusal for public authorities), and instalment of rent caps and minimum lease terms. Another approach could be to improve proximity scores throughout the area without strongly affecting the relative ranking of the current situation, related to the 'just green enough' strategy [33]. The gradual implementation of the BASE and SUPP scenarios in the BCR largely allow maintaining this relative ranking. To assess GS availability and the effect of future developments, scenario simulation is a key element in decision-making and design.

The sustainable regional development plan [49,50] points out the need for strategic and holistic plans for the BCR that comprise the entire region [51]. The realization of such plans can be supported by the findings of this study, as well as by the tool that was presented. Effective green space planning is of crucial importance, especially in already compact cities [39] due to the many constraints, and particularly, the scarcity of space [52–54].

As partly demonstrated by the design exercises, public green space planning requires more information than is available on ecosystem services and social valuation [55]. Citizen input can be of key importance for the collection of this information. Over the years, the research and planning community has experimented with Participatory GIS (PGIS), also referred to as Public Participation GIS (PPGIS). PPGIS is a framework that allows the combination of expert knowledge and public input [56] by means of map-based surveys or geo-questionnaires [57,58]. Whereas participatory mapping was the 'analogue' procedure, PPGIS is digital [58]. This tool can help, for example, to target conflict areas, identify user preferences, improve the accuracy of expert-based assessments, enhance multifunctionality assessment, and especially, ensure social inclusion in the process. [55]. However, PPGIS cannot substitute debate over planning alternatives [55,59,60].

Whereas most proposals or experiments with PPGIS focus on the collection of information about existing GS, the potential for PPGIS is different in this case. The public can be consulted for two action points in the methodology: identifying OGSD and defining scenarios. For defining OGSD, an interactive mapping tool can be created, where users can delineate OGSD, identify the type of interventions related to it (e.g., land acquisition, deviating traffic), and receive real-time feedback about two indicators: to which socio-economic subgroups the GS caters, and how many people have the GS within reach (and no other GS of the same functional level), per GS area. Both are impact indicators of a specific type. For the defining of the scenarios, users can select either their own delineated spaces or spaces delineated by other users. These PPGIS interactions also have the potential to take form as a game, whereby the goal is to achieve maximum impact with limited resources, in a fair and equitable way. Studies have found that the combination of decision support tools and gaming procedures can support agenda setting and foster a shared understanding of challenges and potential solutions in the field of sustainable urban renewal [61].

While this study focuses on GS proximity, recent work [41] has demonstrated that inherent aspects of GS quality, such as naturalness and spaciousness, and how these qualities are valued by GS users, may be predicted from land-cover-based variables such as the fraction of dense/woody vegetation, herbaceous vegetation, impervious area, and water within GS, as well as from variables indicating biological value. By including these types of variables in design exercises, the methodology proposed in this study may be extended by incorporating aspects of GS quality in the scenario modelling. Since quality indicators partly require use-related ratings [41], the common use of PPGIS (data collection for existing GS) can be applied in this case.

5. Conclusions

Collaborative design was mobilised to explore the potential for GS development in Brussels and its surroundings. Analysis of the current state and of three GS development scenarios corresponding to different investment levels were conducted with the proximity model developed by Stessens, Khan, Huysmans and Canters [25], which enables spatially explicit analysis of citizen's access to green spaces of different sizes, fulfilling different needs. Impact analysis showed that inhabitants of low-income neighbourhoods have limited access to larger green spaces. Actions to provide low-income neighbourhoods with a good accessibility to public green spaces require creative solutions. These are spatial solutions, dealing with property, management, and investments that go beyond the cost of regular GS development. Legal frameworks to designate urban GS are essential for reaching intended goals [39].

The main objective of this paper was to identify possible GS development scenarios for the Brussels' study area and to assess how these scenarios benefit the population of Brussels as a whole, as well as different socio-economic segments of the population. The proposed method generated an unprecedented view on the practical feasibility of providing a high degree of GS proximity for the inhabitants of the Brussels-Capital Region and its surroundings. Whereas ordinary GS development would benefit both poor and rich neighbourhoods to a very low degree, medium to high investments will mainly advance the poorer neighbourhoods and bring them to a comparable level of GS proximity as the wealthier areas. The socio-economic bias of benefits by urban GS provision in the form of recreational nature, which is described in literature and proven for the case of Brussels, can be resolved. A caution towards negative effects of gentrification is advised, however.

The creation of scenarios involved collaborative workshops where: (i) the GS proximity indicators developed in Stessens, Khan, Huysmans and Canters [25], along with the proposed supplementary maps were deemed very useful for identifying problem areas and locations and proposing solutions; (ii) the process of collaborative RbD has proven to be an appropriate method for the same goal, especially for discussing the feasibility of solutions, and; (iii) the necessity of the combination of various indicator maps and supplementary maps has confirmed the effectiveness of the graphic overlay method, commonly used in landscape design. The creation of scenarios can benefit from additional data regarding the financial impact of proposed GS developments; however, the great relative investment scales allow for a rough classification from practical experience. A coarse classification of OGSD proved to be sufficient to formulate scenarios. The analysis of interventions needed for the realization for each OGSD resulted in a classification according to recurrent types per TFL. This is valuable information for further analysis, as they can streamline the process of finding OGSD in new cases.

The research is novel in its combination of three aspects: (i) high-resolution proximity indicators, calculated at the urban block level, using path network distances; (ii) in-depth collaborative and individual RbD exercises (162 OGSD with estimated investment class); and (iii) scenario impact in relation to socio-economic indicators. Few academic studies have performed similar in-depth analyses of concrete situations with the support of GIS models and collaborative RbD. This is a method with significant potential for future studies and application potential for policy documents and spatial development plans.

Future research can be conducted on the mapping of aspects of inherent GS quality (quietness, naturalness, historical/cultural value), not for existing spaces, but for the remaining open space where OGSD can be located. This would be a valuable data layer to be involved in defining scenarios. The whole methodology can be streamlined by creating a user interface with real-time feedback on consequences of choosing certain locations of OGSD, for example, demographic impact, investment scale, water buffering potential, ecological network, or inherent quality aspects.

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Conflicts of Interest: The authors have no conflict of interest to declare.

Appendix A

Table A1. Listing of identified opportunities for green space development and involved strategies 1/5 (continued on next page).

	Type–Name/Count	Tunnel Construction	Infrastructure Works	Compulsory Res. Real Estate Acquisition	Compulsory Industr. Real Estate Acquisition	Changing Public Facilities	Agricultural Land Acquisition	Noise Barriers	Constructing Paths and Routes	Number of Strategies–59	Number of Strategies for Metropolitan GS–9	Number of Strategies for City GS–8	Number of Strategies for District GS–13	Number of Strategies for Quarter GS–9	Number of Strategies for Neighborhood GS–21	Number of Strategies for Play GS–5	Number of Strategies for Residential GS–8	Intra-Urban Metropolitan GS	Peri-Urban Metripolitan GS	Rural Metropolitan GS	Valley Parks	Agriculture Reconversions to Valley Parks	Agriculture Reconversions	Urban Space Optimization	Functional Level Scaling	Inner City District GS Optimization	Inner City Continuous Spaces	Peri-urban District GS Development	De-Privatizing Domains	Rural Disctrict GS	District GS Development in Tributary Valleys	Expanding Existing Parks	Conversion/Reorganization	Green Roof on Commercial Buildings	Converting Farmland to Park Space	Railroad Optimization	Private Gardens to Park Space	Mega-Block	De-Privatizing Estates	Public Space Redevelopment of Housing Blocks	Reorganizing Sports Fields	Brownfield Development	Rural Neighborhood GS Development
	TFL/N°									Σ	M	C	D	Q	N	P	R	M	M	M	C	C	C	C	D	D	D	D	D	D	D	Q	Q	Q	Q	N	N	N	N	N	N	N	N
	High investment class–FULL scenario																	x						x		x						x											
	Middle investment class–SUPP scenario																	x		x				x		x	x					x				x	x	x		x			
	Low investment class–BASE scenario																		x		x	x	x		x			x	x	x	x		x	x	x				x		x	x	x
1	Developing wetlands in valley bottom									12	4	5	2	1	0	0	0	x	x		x	x									x												
2	Developing a blue-green network									20	9	6	2	2	0	0	0	x	x	x	x	x									x												
3	Deploying walking and cycling trajectories								x	21	9	8	0	0	0	2	1	x	x	x	x	x	x																				
4	Converting agricultural fields to park space with small scale agricultural character						x			59	9	6	13	9	21	0	0	x	x	x		x	x					x		x					x								x
5	Developing green areas around upstream tributaries									11	5	3	3	0	0	0	0			x			x					x															
6	Cutting local road									30	7	5	6	8	0	2	1	x	x	x		x		x			x	x					x										
7	Connecting existing public green spaces									29	8	7	6	7	0	0	0	x	x	x	x	x		x								x											
8	Halting housing development									9	5	3	0	0	0	0	0		x	x																							
9	Reversing housing development			x						7	5	2	0	0	0	0	0			x																							
10	Noise shielding							x		19	6	2	5	4	2	0	0	x	x	x								x															
11	Integrating protected landscapes									11	5	1	4	0	0	0	0	x	x	x								x	x														

Table A1. *Cont.*

	Type–Name/Count	Tunnel Construction	Infrastructure Works	Compulsory Res. Real Estate Acquisition	Compulsory Industr. Real Estate Acquisition	Changing Public Facilities	Agricultural Land Acquisition	Noise Barriers	Constructing Paths and Routes	Number of Strategies–59	Number of Strategies for Metropolitan GS–9	Number of Strategies for City GS–8	Number of Strategies for District GS–13	Number of Strategies for Quarter GS–9	Number of Strategies for Neighborhood GS–21	Number of Strategies for Play GS–5	Number of Strategies for Residential GS–8	Intra-Urban Metropolitan GS	Peri-Urban Metripolitan GS	Rural Metropolitan GS	Valley Parks	Agriculture Reconversions to Valley Parks	Agriculture Reconversions	Urban Space Optimization	Functional Level Scaling	Inner City District GS Optimization	Inner City Continuous Spaces	Peri-urban District GS Development	De-Privatizing Domains	Rural Disctrict GS	District GS Development in Tributary Valleys	Expanding Existing Parks	Conversion/Reorganization	Green Roof on Commercial Buildings	Converting Farmland to Park Space	Railroad Optimization	Private Gardens to Park Space	Mega-Block	De-Privatizing Estates	Public Space Redevelopment of Housing Blocks	Reorganizing Sports Fields	Brownfield Development	Rural Neighborhood GS Development
	TFL/N°									Σ	M	C	D	Q	N	P	R	M	M	M	C	C	C	C	D	D	D	D	D	D	D	Q	Q	Q	Q	N	N	N	N	N	N	N	N
12	Integrating estates									10	0	1	1	3	5	0	0												x										x				
13	Connecting separate parts over 2 × 2-lane road	x								4	2	1	1	0	0	0	0	x																									
14	Connecting to railway station									11	4	2	1	2	0	1	1	x						x																			
15	Covering open railroad trenches	x								9	0	2	2	0	5	0	0							x												x							
16	Connecting to tram station									15	2	3	5	5	0	0	0	x						x			x					x											
17	Extending park over local road up to sidewalk									4	0	0	3	0	0	1	0										x																
18	Re-routing roads and traffic around or away from park		x							8	0	0	4	1	2	1	0										x																
19	Putting through traffic underground/covering open tunnels	x								9	0	0	5	3	1	0	0									x						x											
20	Transforming urban boulevard to park strip		x							4	0	0	0	2	1	0	1																										
21	Greening tram beds crossing the GS									2	0	0	2	0	0	0	0								x																		
22	Cutting park drives for cars									2	0	1	1	0	0	0	0								x																		
23	Connecting to metro station									7	1	0	2	4	0	0	0								x							x											
24	Re-integrating derelict/brownfield / unused land									7	1	0	2	1	2	0	1								x																	x	
25	Connecting to highway									4	3	1	0	0	0	0	0																										
26	Moving logistic activities and light industry				x					8	1	1	1	1	3	0	1																										

Table A1. *Cont.*

	Type–Name/Count	Tunnel Construction	Infrastructure Works	Compulsory Res. Real Estate Acquisition	Compulsory Industr. Real Estate Acquisition	Changing Public Facilities	Agricultural Land Acquisition	Noise Barriers	Constructing Paths and Routes	Number of Strategies–59	Number of Strategies for Metropolitan GS–9	Number of Strategies for City GS–8	Number of Strategies for District GS–13	Number of Strategies for Quarter GS–9	Number of Strategies for Neighborhood GS–21	Number of Strategies for Play GS–5	Number of Strategies for Residential GS–8	Intra-Urban Metropolitan GS	Peri-Urban Metripolitan GS	Rural Metropolitan GS	Valley Parks	Agriculture Reconversions to Valley Parks	Agriculture Reconversions	Urban Space Optimization	Functional Level Scaling	Inner City District GS Optimization	Inner City Continuous Spaces	Peri-urban District GS Development	De-Privatizing Domains	Rural Disctrict GS	District GS Development in Tributary Valleys	Expanding Existing Parks	Conversion/Reorganization	Green Roof on Commercial Buildings	Converting Farmland to Park Space	Railroad Optimization	Private Gardens to Park Space	Mega-Block	De-Privatizing Estates	Public Space Redevelopment of Housing Blocks	Reorganizing Sports Fields	Brownfield Development	Rural Neighborhood GS Development
	TFL/N°									Σ	M	C	D	Q	N	P	R	M	M	M	C	C	C	C	D	D	D	D	D	D	D	Q	Q	Q	Q	N	N	N	N	N	N	N	N
27	Integrating nature reserves									2	1	1	0	0	0	0	0																										
28	Connecting separate parts over highway	x								2	2	0	0	0	0	0	0																										
29	Connecting over causeway	x								3	2	0	0	1	0	0	0																										
30	Connecting over/under local road	x								7	1	1	2	2	1	0	0																										
31	Visual shielding									4	1	0	2	0	1	0	0																										
32	Making fenced off grounds accessible integrating sports grounds									5	0	1	2	1	1	0	0																										
33	Renegociating industrial land for shared use									4	1	0	0	0	0	3	0																										
34	Connecting nearby housing projects with parkspace									4	0	0	2	0	0	0	2																										
35	Re-designing ground floor and terrains of 60's housing blocks		x							8	0	0	1	0	6	0	1																							x			
36	Developing real estate around GS									5	0	0	0	5	0	0	0																x										
37	Reorganizing open air sports facilities					x				10	0	0	0	3	4	2	1																x								x		
38	Opening up impervious surfaces									20	0	0	2	5	0	5	8										x							x									
39	Rooftop park extension on commercial buildings									1	0	0	0	1	0	0	0																	x									
40	Rooftop park extension on public buildings					x				3	0	0	0	2	0	0	1																	x									
41	Creating passages in-between buildings									5	0	0	0	2	0	0	3																										

Table A1. *Cont.*

	Type–Name/Count	Tunnel Construction	Infrastructure Works	Compulsory Res. Real Estate Acquisition	Compulsory Industr. Real Estate Acquisition	Changing Public Facilities	Agricultural Land Acquisition	Noise Barriers	Constructing Paths and Routes	Number of Strategies–59	Number of Strategies for Metropolitan GS–9	Number of Strategies for City GS–8	Number of Strategies for District GS–13	Number of Strategies for Quarter GS–9	Number of Strategies for Neighborhood GS–21	Number of Strategies for Play GS–5	Number of Strategies for Residential GS–8	Intra-Urban Metropolitan GS	Peri-Urban Metripolitan GS	Rural Metropolitan GS	Valley Parks	Agriculture Reconversions to Valley Parks	Agriculture Reconversions	Urban Space Optimization	Functional Level Scaling	Inner City District GS Optimization	Inner City Continuous Spaces	Peri-urban District GS Development	De-Privatizing Domains	Rural Disctrict GS	District GS Development in Tributary Valleys	Expanding Existing Parks	Conversion/Reorganization	Green Roof on Commercial Buildings	Converting Farmland to Park Space	Railroad Optimization	Private Gardens to Park Space	Mega-Block	De-Privatizing Estates	Public Space Redevelopment of Housing Blocks	Reorganizing Sports Fields	Brownfield Development	Rural Neighborhood GS Development
	TFL/N°									Σ	M	C	D	Q	N	P	R	M	M	M	C	C	C	C	D	D	D	D	D	D	D	Q	Q	Q	Q	N	N	N	N	N	N	N	N
42	Mega-roundabout		x							1	0	1	0	0	0	0	0																										
43	Mega-block		x							4	0	0	0	0	4	0	0																					x					
44	Part of private garden to parkspace			x						17	0	0	2	2	8	0	5																				x						
45	GS as part of strategic site redevelopment									2	0	0	0	1	0	0	1																										
46	Connecting over water body									2	1	0	0	0	0	0	0																										
47	GS in shared use with public services									3	0	0	0	0	2	0	0																										
48	Transforming local road into GS									13	0	0	0	1	8	2	2																										
49	Transformation public space into park									7	0	0	0	0	3	3	1																										
50	Rooftop park on top of industrial building									6	0	0	0	0	1	4	1																										
51	Reversing commercial building									2	0	0	0	0	0	2	0																										
52	Demolishing existing building for creation of GS									2	0	0	0	0	1	0	1																										
53	Converting parking space into GS									4	0	0	0	0	2	1	1																										
54	Cutting parking spaces									7	0	0	0	1	4	0	2																										
55	Activation of unused lawn									9	0	0	0	1	5	0	3																										

Table A2. Listing of identified opportunities for green space development and involved strategies 2/5 (continued on next page).

	Type–Name/Count	**Intra-Urban MGS—Koning Boudewijnpark, Moeras van Ganshoren, ...**	**Intra-Urban MGS—Zuidelijke Zennevallei**	**Peri-Urban MGS–Perk**	**Rural MGS–Asse**	**Rural MGS–Neerpede**	**Rural MGS–Groenenberg**	**Rural MGS - Kravaalbos (Liedekerke)**	**Rural MGS–Hertigembos**	**Rural MGS–Plutsingen**	**Rural MGS–Kanaal**	**Valley Parks–Bollebeek**	**Valley Parks–Hagaard**	**Agreculture Reconversion to Valley Parks—Merchtem**	**Agreculture Reconversion to Valley Parks—Sint-Martens Bodegem Park**	**Agreculture Reconversion to Valley Parks–Sint-Pieters-Leeuw**	**Agriculture Reconversions–NATO**	**Agriculture Reconversions–Moorsel**	**Urban space Optimization–Scheutbos**	**Un-Fragmented Park Space–Terkamerenbos**	**Urban Space Optimization–Josaphat**	**Functional Level Scaling—Albertpark, Marie-Josépark, Weststation**	**Functional Level Scaling—Tour&Taxis**	**Inner City District GS Optimization–Jubelpark**	**Inner City District GS Optimization–Koekelberg**	**Inner City District GS Optimization–Warandepark**	**Continuous Inner City Spaces–Vijvers van Elsene, Abdij**	**Continuous Inner City Spaces—Ste. Catherine**	**Peri-Urban DGS Development–Zellik**	**Peri-Urban DGS Development–Diegem**	**Peri-Urban DGS Development–Machelen**	**Peri-Urban DGS Development–Faubourg**	**Peri-Urban DGS Development–Zaventem**	**De-Privatizing Domains–Kasteel ter Meeren**	**Rural DGS–De Hoek**	**Rural DGS–La hulpe**	**Valley Bottom DGS–La hulpe Vallée**	**Highway Rooftop Park–R0 Afrit 1-2**	**Inner City DGS Optimization–Visserij**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**
	TFL/N°	M1	M9	M4	M5	M2	M3	M6	M7	M8	M10	C1	C2	C4	C5	C6	C8	C9	C10	C11	C12	D1	D6	D2	D3	D5	D7	D18	D8	D10	D11	D12	D13	D14	D15	D16	D17	D9	D19	D20	D22	D23	D24	D28	D29
	High investment class–FULL scenario	x	x																		x	x			x							x							x						
	Middle investment class–SUPP scenario			x		x	x	x	x	x					x				x	x			x	x		x	x	x										x							
	Low investment class–BASE scenario				x						x	x	x	x		x	x	x											x	x	x		x	x	x	x	x			x	x	x	x	x	x
1	Developing wetlands in valley bottom		x	x		x	x					x	x	x	x	x																					x		x						
2	Developing a blue-green network	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x														x				x								
3	Deploying walking and cycling trajectories	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x																										
4	Converting agricultural fields to park space with small scale agricultural character	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x	x										x	x	x	x	x		x	x				x	x	x	x	x	x
5	Developing green areas around upstream tributaries				x	x	x		x	x							x	x	x										x	x	x														
6	Cutting local road	x	x	x			x	x	x	x	x			x	x	x				x	x						x	x	x		x	x							x						

Table A2. *Cont.*

Type–Name/Count		**Intra-Urban MGS—Koning Boudewijnpark, Moeras van Ganshoren, ...**	**Intra-Urban MGS—Zuidelijke Zennevallei**	**Peri-Urban MGS–Perk**	**Rural MGS–Asse**	**Rural MGS–Neerpede**	**Rural MGS–Groenenberg**	**Rural MGS - Kravaalbos (Liedekerke)**	**Rural MGS–Hertigembos**	**Rural MGS–Plutsingen**	**Rural MGS–Kanaal**	**Valley Parks–Bollebeek**	**Valley Parks–Hagaard**	**Agreculture Reconversion to Valley Parks—Merchtem**	**Agreculture Reconversion to Valley Parks—Sint-Martens Bodegem Park**	**Agreculture Reconversion to Valley Parks–Sint-Pieters-Leeuw**	**Agriculture Reconversions–NATO**	**Agriculture Reconversions–Moorsel**	**Urban space Optimization–Scheutbos**	**Un-Fragmented Park Space–Terkamerenbos**	**Urban Space Optimization–Josaphat**	**Functional Level Scaling—Albertpark, Marie-Josépark, Weststation**	**Functional Level Scaling—Tour&Taxis**	**Inner City District GS Optimization–Jubelpark**	**Inner City District GS Optimization–Koekelberg**	**Inner City District GS Optimization–Warandepark**	**Continuous Inner City Spaces–Vijvers van Elsene, Abdij**	**Continuous Inner City Spaces—Ste. Catherine**	**Peri-Urban DGS Development–Zellik**	**Peri-Urban DGS Development–Diegem**	**Peri-Urban DGS Development–Machelen**	**Peri-Urban DGS Development–Faubourg**	**Peri-Urban DGS Development–Zaventem**	**De-Privatizing Domains–Kasteel ter Meeren**	**Rural DGS–De Hoek**	**Rural DGS–La hulpe**	**Valley Bottom DGS–La hulpe Vallée**	**Highway Rooftop Park–R0 Afrit 1-2**	**Inner City DGS Optimization–Visserij**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**
	TFL/N°	M1	M9	M4	M5	M2	M3	M6	M7	M8	M10	C1	C2	C4	C5	C6	C8	C9	C10	C11	C12	D1	D6	D2	D3	D5	D7	D18	D8	D10	D11	D12	D13	D14	D15	D16	D17	D9	D19	D20	D22	D23	D24	D28	D29
7	Connecting existing public green spaces	x	x	x	x		x	x	x	x	x	x	x		x	x			x	x	x	x	x					x					x			x			x						
8	Halting housing development			x		x	x	x	x		x				x	x			x																										
9	Reversing housing development					x	x	x	x	x					x				x																										
10	Noise shielding	x	x	x		x		x	x				x								x								x	x	x	x	x												
11	Integrating protected landscapes		x	x	x		x		x		x				x														x	x	x			x											
12	Integrating estates												x																					x											
13	Connecting separate parts over 2 × 2-lane road	x	x																		x											x													
14	Connecting to railway station	x	x		x				x											x	x		x																						
15	Covering open railroad trenches																			x	x	x	x																						

Table A2. *Cont.*

Type–Name/Count		**Intra-Urban MGS—Koning Boudewijnpark, Moeras van Ganshoren, …**	**Intra-Urban MGS—Zuidelijke Zennevallei**	**Peri-Urban MGS–Perk**	**Rural MGS–Asse**	**Rural MGS–Neerpede**	**Rural MGS–Groenenberg**	**Rural MGS - Kravaalbos (Liedekerke)**	**Rural MGS–Hertigembos**	**Rural MGS–Plutsingen**	**Rural MGS–Kanaal**	**Valley Parks–Bollebeek**	**Valley Parks–Hagaard**	**Agreculture Reconversion to Valley Parks—Merchtem**	**Agreculture Reconversion to Valley Parks—Sint-Martens Bodegem Park**	**Agreculture Reconversion to Valley Parks–Sint-Pieters-Leeuw**	**Agriculture Reconversions–NATO**	**Agriculture Reconversions–Moorsel**	**Urban space Optimization–Scheutbos**	**Un-Fragmented Park Space–Terkamerenbos**	**Urban Space Optimization–Josaphat**	**Functional Level Scaling—Albertpark, Marie-Josépark, Weststation**	**Functional Level Scaling—Tour&Taxis**	**Inner City District GS Optimization–Jubelpark**	**Inner City District GS Optimization–Koekelberg**	**Inner City District GS Optimization–Warandepark**	**Continuous Inner City Spaces–Vijvers van Elsene, Abdij**	**Continuous Inner City Spaces—Ste. Catherine**	**Peri-Urban DGS Development–Zellik**	**Peri-Urban DGS Development–Diegem**	**Peri-Urban DGS Development–Machelen**	**Peri-Urban DGS Development–Faubourg**	**Peri-Urban DGS Development–Zaventem**	**De-Privatizing Domains–Kasteel ter Meeren**	**Rural DGS–De Hoek**	**Rural DGS–La hulpe**	**Valley Bottom DGS–La hulpe Vallée**	**Highway Rooftop Park–R0 Afrit 1-2**	**Inner City DGS Optimization–Visserij**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**
	TFL/N°	M1	M9	M4	M5	M2	M3	M6	M7	M8	M10	C1	C2	C4	C5	C6	C8	C9	C10	C11	C12	D1	D6	D2	D3	D5	D7	D18	D8	D10	D11	D12	D13	D14	D15	D16	D17	D9	D19	D20	D22	D23	D24	D28	D29
16	Connecting to tram station	x	x																x	x	x	x	x			x	x	x																	
17	Extending park over local road up to sidewalk																									x	x	x																	
18	Re-routing roads and traffic around or away from park																					x			x		x	x																	
19	Putting through traffic underground/covering open tunnels																							x	x	x						x						x							
20	Transforming urban boulevard to park strip																																												
21	Greening tram beds crossing the GS																					x	x																						
22	Cutting park drives for cars																			x		x																							
23	Connecting to metro station					x																x	x																						
24	Re-integrating derelict/brownfield/unused land		x																			x	x																						

Table A2. *Cont.*

	Type–Name/Count	Intra-Urban MGS—Koning Boudewijnpark, Moeras van Ganshoren, …	Intra-Urban MGS—Zuidelijke Zennevallei	Peri-Urban MGS–Perk	Rural MGS–Asse	Rural MGS–Neerpede	Rural MGS–Groenenberg	Rural MGS - Kravaalbos (Liedekerke)	Rural MGS–Hertigembos	Rural MGS–Plutsingen	Rural MGS–Kanaal	Valley Parks–Bollebeek	Valley Parks–Hagaard	Agreculture Reconversion to Valley Parks—Merchtem	Agreculture Reconversion to Valley Parks—Sint-Martens Bodegem Park	Agreculture Reconversion to Valley Parks–Sint-Pieters-Leeuw	Agriculture Reconversions–NATO	Agriculture Reconversions–Moorsel	Urban space Optimization–Scheutbos	Un-Fragmented Park Space–Terkamerenbos	Urban Space Optimization–Josaphat	Functional Level Scaling—Albertpark, Marie-Josépark, Weststation	Functional Level Scaling—Tour&Taxis	Inner City District GS Optimization–Jubelpark	Inner City District GS Optimization–Koekelberg	Inner City District GS Optimization–Warandepark	Continuous Inner City Spaces–Vijvers van Elsene, Abdij	Continuous Inner City Spaces—Ste. Catherine	Peri-Urban DGS Development–Zellik	Peri-Urban DGS Development–Diegem	Peri-Urban DGS Development–Machelen	Peri-Urban DGS Development–Faubourg	Peri-Urban DGS Development–Zaventem	De-Privatizing Domains–Kasteel ter Meeren	Rural DGS–De Hoek	Rural DGS–La hulpe	Valley Bottom DGS–La hulpe Vallée	Highway Rooftop Park–R0 Afrit 1-2	Inner City DGS Optimization–Visserij	Rural DGS Development	Rural DGS Development	Rural DGS Development	Rural DGS Development	Rural DGS Development	Rural DGS Development
	TFL/N°	M1	M9	M4	M5	M2	M3	M6	M7	M8	M10	C1	C2	C4	C5	C6	C8	C9	C10	C11	C12	D1	D6	D2	D3	D5	D7	D18	D8	D10	D11	D12	D13	D14	D15	D16	D17	D9	D19	D20	D22	D23	D24	D28	D29
25	Connecting to highway		x	x					x				x																																
26	Moving logistic activities and light industry		x																		x											x													
27	Integrating nature reserves						x									x																													
28	Connecting separate parts over highway	x	x																																										
29	Connecting over causeway		x	x																																									
30	Connecting over/under local road		x																		x	x																	x						
31	Visual shielding				x																							x				x													
32	Making fenced off grounds accessible integrating sports grounds																				x	x																	x						
33	Renegociating industrial land for shared use		x																																										

Table A2. *Cont.*

	Type–Name/Count	**Intra-Urban MGS—Koning Boudewijnpark, Moeras van Ganshoren, ...**	**Intra-Urban MGS—Zuidelijke Zennevallei**	**Peri-Urban MGS–Perk**	**Rural MGS–Asse**	**Rural MGS–Neerpede**	**Rural MGS–Groenenberg**	**Rural MGS - Kravaalbos (Liedekerke)**	**Rural MGS–Hertigembos**	**Rural MGS–Plutsingen**	**Rural MGS–Kanaal**	**Valley Parks–Bollebeek**	**Valley Parks–Hagaard**	**Agreculture Reconversion to Valley Parks—Merchtem**	**Agreculture Reconversion to Valley Parks—Sint-Martens Bodegem Park**	**Agreculture Reconversion to Valley Parks–Sint-Pieters-Leeuw**	**Agriculture Reconversions–NATO**	**Agriculture Reconversions–Moorsel**	**Urban space Optimization–Scheutbos**	**Un-Fragmented Park Space–Terkamerenbos**	**Urban Space Optimization–Josaphat**	**Functional Level Scaling—Albertpark, Marie-Josépark, Weststation**	**Functional Level Scaling—Tour&Taxis**	**Inner City District GS Optimization–Jubelpark**	**Inner City District GS Optimization–Koekelberg**	**Inner City District GS Optimization–Warandepark**	**Continuous Inner City Spaces–Vijvers van Elsene, Abdij**	**Continuous Inner City Spaces—Ste. Catherine**	**Peri-Urban DGS Development–Zellik**	**Peri-Urban DGS Development–Diegem**	**Peri-Urban DGS Development–Machelen**	**Peri-Urban DGS Development–Faubourg**	**Peri-Urban DGS Development–Zaventem**	**De-Privatizing Domains–Kasteel ter Meeren**	**Rural DGS–De Hoek**	**Rural DGS–La hulpe**	**Valley Bottom DGS–La hulpe Vallée**	**Highway Rooftop Park–R0 Afrit 1-2**	**Inner City DGS Optimization–Visserij**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**
	TFL/N°	M1	M9	M4	M5	M2	M3	M6	M7	M8	M10	C1	C2	C4	C5	C6	C8	C9	C10	C11	C12	D1	D6	D2	D3	D5	D7	D18	D8	D10	D11	D12	D13	D14	D15	D16	D17	D9	D19	D20	D22	D23	D24	D28	D29
34	Connecting nearby housing projects with parkspace																					x																	x						
35	Re-designing ground floor and terrains of 60's housing blocks																																						x						
36	Developing real estate around GS																																												
37	Reorganizing open air sports facilities																																												
38	Opening up impervious surfaces																										x	x																	
39	Rooftop park extension on commercial buildings																																												
40	Rooftop park extension on public buildings																																												
41	Creating passages in-between buildings																																												
42	Mega-roundabout																				x																								

Table A2. *Cont.*

	Type–Name/Count	**Intra-Urban MGS—Koning Boudewijnpark, Moeras van Ganshoren, ...**	**Intra-Urban MGS—Zuidelijke Zennevallei**	**Peri-Urban MGS–Perk**	**Rural MGS–Asse**	**Rural MGS–Neerpede**	**Rural MGS–Groenenberg**	**Rural MGS - Kravaalbos (Liedekerke)**	**Rural MGS–Hertigembos**	**Rural MGS–Plutsingen**	**Rural MGS–Kanaal**	**Valley Parks–Bollebeek**	**Valley Parks–Hagaard**	**Agreculture Reconversion to Valley Parks—Merchtem**	**Agreculture Reconversion to Valley Parks—Sint-Martens Bodegem Park**	**Agreculture Reconversion to Valley Parks–Sint-Pieters-Leeuw**	**Agriculture Reconversions–NATO**	**Agriculture Reconversions–Moorsel**	**Urban space Optimization–Scheutbos**	**Un-Fragmented Park Space–Terkamerenbos**	**Urban Space Optimization–Josaphat**	**Functional Level Scaling—Albertpark, Marie-Josépark, Weststation**	**Functional Level Scaling—Tour&Taxis**	**Inner City District GS Optimization–Jubelpark**	**Inner City District GS Optimization–Koekelberg**	**Inner City District GS Optimization–Warandepark**	**Continuous Inner City Spaces–Vijvers van Elsene, Abdij**	**Continuous Inner City Spaces—Ste. Catherine**	**Peri-Urban DGS Development–Zellik**	**Peri-Urban DGS Development–Diegem**	**Peri-Urban DGS Development–Machelen**	**Peri-Urban DGS Development–Faubourg**	**Peri-Urban DGS Development–Zaventem**	**De-Privatizing Domains–Kasteel ter Meeren**	**Rural DGS–De Hoek**	**Rural DGS–La hulpe**	**Valley Bottom DGS–La hulpe Vallée**	**Highway Rooftop Park–R0 Afrit 1-2**	**Inner City DGS Optimization–Visserij**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**
	TFL/N°	M1	M9	M4	M5	M2	M3	M6	M7	M8	M10	C1	C2	C4	C5	C6	C8	C9	C10	C11	C12	D1	D6	D2	D3	D5	D7	D18	D8	D10	D11	D12	D13	D14	D15	D16	D17	D9	D19	D20	D22	D23	D24	D28	D29
43	Mega-block																																												
44	Part of private garden to parkspace																								x			x																	
45	GS as part of strategic site redevelopment																																												
46	Connecting over water body	x									x																																		
47	GS in shared use with public services																																												
48	Transforming local road into GS																																												
49	Transformation public space into park																																												
50	Rooftop park on top of industrial building																																												

Table A2. *Cont.*

	Type–Name/Count	**Intra-Urban MGS—Koning Boudewijnpark, Moeras van Ganshoren, ...**	**Intra-Urban MGS—Zuidelijke Zennevallei**	**Peri-Urban MGS–Perk**	**Rural MGS–Asse**	**Rural MGS–Neerpede**	**Rural MGS–Groenenberg**	**Rural MGS - Kravaalbos (Liedekerke)**	**Rural MGS–Hertigembos**	**Rural MGS–Plutsingen**	**Rural MGS–Kanaal**	**Valley Parks–Bollebeek**	**Valley Parks–Hagaard**	**Agreculture Reconversion to Valley Parks—Merchtem**	**Agreculture Reconversion to Valley Parks—Sint-Martens Bodegem Park**	**Agreculture Reconversion to Valley Parks–Sint-Pieters-Leeuw**	**Agriculture Reconversions–NATO**	**Agriculture Reconversions–Moorsel**	**Urban space Optimization–Scheutbos**	**Un-Fragmented Park Space–Terkamerenbos**	**Urban Space Optimization–Josaphat**	**Functional Level Scaling—Albertpark, Marie-Josépark, Weststation**	**Functional Level Scaling—Tour&Taxis**	**Inner City District GS Optimization–Jubelpark**	**Inner City District GS Optimization–Koekelberg**	**Inner City District GS Optimization–Warandepark**	**Continuous Inner City Spaces–Vijvers van Elsene, Abdij**	**Continuous Inner City Spaces—Ste. Catherine**	**Peri-Urban DGS Development–Zellik**	**Peri-Urban DGS Development–Diegem**	**Peri-Urban DGS Development–Machelen**	**Peri-Urban DGS Development–Faubourg**	**Peri-Urban DGS Development–Zaventem**	**De-Privatizing Domains–Kasteeel ter Meeren**	**Rural DGS–De Hoek**	**Rural DGS–La hulpe**	**Valley Bottom DGS–La hulpe Vallée**	**Highway Rooftop Park–R0 Afrit 1-2**	**Inner City DGS Optimization–Visserij**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**	**Rural DGS Development**
	TFL/N°	M1	M9	M4	M5	M2	M3	M6	M7	M8	M10	C1	C2	C4	C5	C6	C8	C9	C10	C11	C12	D1	D6	D2	D3	D5	D7	D18	D8	D10	D11	D12	D13	D14	D15	D16	D17	D9	D19	D20	D22	D23	D24	D28	D29
51	Reversing commercial building																																												
52	Demolishing existing building for creation of GS																																												
53	Converting parking space into GS																																												
54	Cutting parking spaces																																												
55	Activation of unused lawn																																												

Table A3. Listing of identified opportunities for green space development and involved strategies 3/5 (continued on next page).

	Type–Name/Count	**Opening up Hardscape–Abbattoir**	**Expanding Park–Kruidtuin**	**Inner city District GS Optimization–Hallepoort**	**Boulevard to Parkstrip–Montgomery**	**Expanding Park–Haren**	**Complex Node–Ninoofsepoort**	**Conversion of Sport and Industrial Land–Schaarbeek Kerkhof**	**Reorganization of Sports–Machelen**	**Sports Facilities to Green roof–Zaventem**	**Commercial Green Roof–Witte Cité**	**Commercial Green Roof–Hanssenpark**	**Prison to Park–Ducpétiaux**	**Farmland to Park–Diegem**	**Farmland to Park–Nossegem**	**Farmland to Park–Smeiberg**	**Farmland to Park–Hoge Heide**	**Farmland to Park–Terrestpark**	**Farmland to Park–Drogenberg**	**Opening up Valley Forest–Hagaard**	**GS as Part of Development–VRT**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Mega-Block**	**Mega-Block**	**Mega-Block**	**Mega-Block**	**Boulevard to Parkstrip**	**Brownfield Development**	**De-Privatizing Estates**	**De-Privatizing Estates**
	TFL/N°	Q1	Q2	Q20	Q5	Q7	Q3	Q6	Q10	Q11	Q9	Q13	Q4	Q8	Q12	Q14	Q15	Q16	Q18	Q17	Q19	N2	N52	N53	N55	N56	N22	N44	N48	N50	N51	N14	N3	N5	N6	N57	N1	N7	N9	N11
	High investment class–FULL scenario		x	x	x																					x											x			
	Middle investment class–SUPP scenario						x	x		x	x								x			x	x	x	x		x	x	x	x	x	x	x	x	x	x				
	Low investment class–BASE scenario	x				x			x			x	x	x	x	x	x	x		x	x																	x	x	x
1	Developing wetlands in valley bottom										x																													
2	Developing a blue-green network										x									x																				
3	Deploying walking and cycling trajectories																																							
4	Converting agricultural fields to park space with small scale agricultural character					x			x	x				x	x	x	x	x	x																					
5	Developing green areas around upstream tributaries																																							
6	Cutting local road	x			x	x	x	x	x			x	x																											
7	Connecting existing public green spaces	x	x	x	x	x	x		x																															
8	Halting housing development																																							

Table A3. *Cont.*

	Type–Name/Count	**Opening up Hardscape–Abbattoir**	**Expanding Park–Kruidtuin**	**Inner city District GS Optimization–Hallepoort**	**Boulevard to Parkstrip–Montgomery**	**Expanding Park–Haren**	**Complex Node–Ninoofsepoort**	**Conversion of Sport and Industrial Land–Schaarbeek Kerkhof**	**Reorganization of Sports–Machelen**	**Sports Facilities to Green roof–Zaventem**	**Commercial Green Roof–Witte Cité**	**Commercial Green Roof–Hanssenpark**	**Prison to Park–Ducpétiaux**	**Farmland to Park–Diegem**	**Farmland to Park–Nossegem**	**Farmland to Park–Smeiberg**	**Farmland to Park–Hoge Heide**	**Farmland to Park–Terrestpark**	**Farmland to Park–Drogenberg**	**Opening up Valley Forest–Hagaard**	**GS as Part of Development–VRT**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Mega-Block**	**Mega-Block**	**Mega-Block**	**Mega-Block**	**Boulevard to Parkstrip**	**Brownfield Development**	**De-Privatizing Estates**	**De-Privatizing Estates**
	TFL/N°	Q1	Q2	Q20	Q5	Q7	Q3	Q6	Q10	Q11	Q9	Q13	Q4	Q8	Q12	Q14	Q15	Q16	Q18	Q17	Q19	N2	N52	N53	N55	N56	N22	N44	N48	N50	N51	N14	N3	N5	N6	N57	N1	N7	N9	N11
9	Reversing housing development																																							
10	Noise shielding		x						x		x	x																										x	x	
11	Integrating protected landscapes																																							
12	Integrating estates				x											x				x			x						x										x	x
13	Connecting separate parts over 2 × 2-lane road																																							
14	Connecting to railway station			x								x																												
15	Covering open railroad trenches																					x	x	x	x	x														
16	Connecting to tram station	x	x		x			x													x																			
17	Extending park over local road up to sidewalk																																							
18	Re-routing roads and traffic around or away from park				x																																x			
19	Putting through traffic underground/covering open tunnels		x	x	x																																x			
20	Transforming urban boulevard to park strip			x	x																																x			

Table A3. *Cont.*

	Type–Name/Count	Opening up Hardscape–Abbattoir	Expanding Park–Kruidtuin	Inner city District GS Optimization–Hallepoort	Boulevard to Parkstrip–Montgomery	Expanding Park–Haren	Complex Node–Ninoofsepoort	Conversion of Sport and Industrial Land–Schaarbeek Kerkhof	Reorganization of Sports–Machelen	Sports Facilities to Green roof–Zaventem	Commercial Green Roof–Witte Cité	Commercial Green Roof–Hanssenpark	Prison to Park–Ducpétiaux	Farmland to Park–Diegem	Farmland to Park–Nossegem	Farmland to Park–Smeiberg	Farmland to Park–Hoge Heide	Farmland to Park–Terrestpark	Farmland to Park–Drogenberg	Opening up Valley Forest–Hagaard	GS as Part of Development–VRT	Railroad Optimization	Railroad Optimization	Railroad Optimization	Railroad Optimization	Railroad Optimization	Private Gardens to Parkspace	Private Gardens to Parkspace	Private Gardens to Parkspace	Private Gardens to Parkspace	Private Gardens to Parkspace	Private Gardens to Parkspace	Mega-Block	Mega-Block	Mega-Block	Mega-Block	Boulevard to Parkstrip	Brownfield Development	De-Privatizing Estates	De-Privatizing Estates
	TFL/N°	Q1	Q2	Q20	Q5	Q7	Q3	Q6	Q10	Q11	Q9	Q13	Q4	Q8	Q12	Q14	Q15	Q16	Q18	Q17	Q19	N2	N52	N53	N55	N56	N22	N44	N48	N50	N51	N14	N3	N5	N6	N57	N1	N7	N9	N11
21	Greening tram beds crossing the GS																																							
22	Cutting park drives for cars																																							
23	Connecting to metro station	x	x	x	x																																			
24	Re-integrating derelict/brownfield/unused land												x																									x		
25	Connecting to highway																																							
26	Moving logistic activities and light industry							x																					x	x										
27	Integrating nature reserves																																							
28	Connecting separate parts over highway																																							
29	Connecting over causeway				x																																			
30	Connecting over/under local road		x								x																													
31	Visual shielding																																					x		
32	Making fenced off grounds accessible integrating sports grounds				x																																	x		

Table A3. *Cont.*

	Type–Name/Count	**Opening up Hardscape–Abbatoir**	**Expanding Park–Kruidtuin**	**Inner city District GS Optimization–Hallepoort**	**Boulevard to Parkstrip–Montgomery**	**Expanding Park–Haren**	**Complex Node–Ninoofsepoort**	**Conversion of Sport and Industrial Land–Schaarbeek Kerkhof**	**Reorganization of Sports–Machelen**	**Sports Facilities to Green roof–Zaventem**	**Commercial Green Roof–Witte Cité**	**Commercial Green Roof–Hanssenpark**	**Prison to Park–Ducpétiaux**	**Farmland to Park–Diegem**	**Farmland to Park–Nossegem**	**Farmland to Park–Smeiberg**	**Farmland to Park–Hoge Heide**	**Farmland to Park–Terrestpark**	**Farmland to Park–Drogenberg**	**Opening up Valley Forest–Hagaard**	**GS as Part of Development–VRT**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Mega-Block**	**Mega-Block**	**Mega-Block**	**Mega-Block**	**Boulevard to Parkstrip**	**Brownfield Development**	**De-Privatizing Estates**	**De-Privatizing Estates**
	TFL/N°	Q1	Q2	Q20	Q5	Q7	Q3	Q6	Q10	Q11	Q9	Q13	Q4	Q8	Q12	Q14	Q15	Q16	Q18	Q17	Q19	N2	N52	N53	N55	N56	N22	N44	N48	N50	N51	N14	N3	N5	N6	N57	N1	N7	N9	N11
33	Renegociating industrial land for shared use																																							
34	Connecting nearby housing projects with parkspace																																							
35	Re-designing ground floor and terrains of 60's housing blocks																																							
36	Developing real estate around GS	x					x	x	x				x																											
37	Reorganizing open air sports facilities							x	x	x																														
38	Opening up impervious surfaces	x			x					x		x									x																			
39	Rooftop park extension on commercial buildings										x																													
40	Rooftop park extension on public buildings									x		x																												
41	Creating passages in-between buildings														x				x																					
42	Mega-roundabout																																							
43	Mega-block																																x	x	x	x				
44	Part of private garden to parkspace						x												x							x	x	x	x	x	x	x								

Table A3. *Cont.*

	Type–Name/Count	**Opening up Hardscape–Abbatoir**	**Expanding Park–Kruidtuin**	**Inner city District GS Optimization–Hallepoort**	**Boulevard to Parkstrip–Montgomery**	**Expanding Park–Haren**	**Complex Node–Ninoofsepoort**	**Conversion of Sport and Industrial Land–Schaarbeek Kerkhof**	**Reorganization of Sports–Machelen**	**Sports Facilities to Green roof–Zaventem**	**Commercial Green Roof–Witte Cité**	**Commercial Green Roof–Hanssenpark**	**Prison to Park–Ducpétiaux**	**Farmland to Park–Diegem**	**Farmland to Park–Nossegem**	**Farmland to Park–Smeiberg**	**Farmland to Park–Hoge Heide**	**Farmland to Park–Terrestpark**	**Farmland to Park–Drogenberg**	**Opening up Valley Forest–Hagaard**	**GS as Part of Development–VRT**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Railroad Optimization**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Private Gardens to Parkspace**	**Mega-Block**	**Mega-Block**	**Mega-Block**	**Mega-Block**	**Boulevard to Parkstrip**	**Brownfield Development**	**De-Privatizing Estates**	**De-Privatizing Estates**
	TFL/N°	Q1	Q2	Q20	Q5	Q7	Q3	Q6	Q10	Q11	Q9	Q13	Q4	Q8	Q12	Q14	Q15	Q16	Q18	Q17	Q19	N2	N52	N53	N55	N56	N22	N44	N48	N50	N51	N14	N3	N5	N6	N57	N1	N7	N9	N11
45	GS as part of strategic site redevelopment																				x																			
46	Connecting over water body																																							
47	GS in shared use with public services																																							
48	Transforming local road into GS													x										x	x	x		x				x								
49	Transformation public space into park																																							
50	Rooftop park on top of industrial building																																							
51	Reversing commercial building																																							
52	Demolishing existing building for creation of GS																																							
53	Converting parking space into GS																							x				x												
54	Cutting parking spaces													x										x		x		x						x						
55	Activation of unused lawn													x																x				x						

Table A4. Listing of identified opportunities for green space development and involved strategies 4/5 (continued on next page).

	Type–Name/Count	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**Reorganizing Sports Fields**	**Reorganizing Sports Fields**	**Reorganizing Sports Fields**	**Reorganizing Sports Fields**	**No Type**	**No Type**	**Industry/Logistics Redesign**	**Brownfield Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Rural NGS Develpment**	**Private Gardens to Parkspace**	**No Type**	**No Type**	**No Type**	**No Type**
	TFL/N°	N4	N17	N36	N45	N46	N49	N21	N32	N38	N15	N23	N24	N47	N54	N8	N10	N12	N13	N18	N19	N20	N25	N27	N28	N29	N30	N31	N33	N34	N35	N37	N39	N40	N41	N42	N58	N59	N60	N61	N62
	High investment class–FULL scenario	x																																							
	Middle investment class–SUPP scenario		x	x	x	x	x																														x				
	Low investment class–BASE scenario							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
1	Developing wetlands in valley bottom																																								
2	Developing a blue-green network																																								
3	Deploying walking and cycling trajectories																																								
4	Converting agricultural fields to park space with small scale agricultural character															x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
5	Developing green areas around upstream tributaries																																								
6	Cutting local road																																								
7	Connecting existing public green spaces																																								
8	Halting housing development																																								
9	Reversing housing development																																								
10	Noise shielding																																								
11	Integrating protected landscapes																																								
12	Integrating estates											x																													
13	Connecting separate parts over 2 × 2-lane road																																								

Table A4. *Cont.*

	Type–Name/Count	60's Housing Public Space Redevelopment	60's Housing Public Space Redevelopment	60's Housing Public Space Redevelopment	60's Housing Public Space Redevelopment	60's Housing Public Space Redevelopment	60's Housing Public Space Redevelopment	Reorganizing Sports Fields	Reorganizing Sports Fields	Reorganizing Sports Fields	Reorganizing Sports Fields	No Type	No Type	Industry/Logistics Redesign	Brownfield Develpment	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Rural NGS Development	Private Gardens to Parkspace	No Type	No Type	No Type	No Type
	TFL/N°	N4	N17	N36	N45	N46	N49	N21	N32	N38	N15	N23	N24	N47	N54	N8	N10	N12	N13	N18	N19	N20	N25	N27	N28	N29	N30	N31	N33	N34	N35	N37	N39	N40	N41	N42	N58	N59	N60	N61	N62
14	Connecting to railway station																																								
15	Covering open railroad trenches																																								
16	Connecting to tram station																																								
17	Extending park over local road up to sidewalk																																								
18	Re-routing roads and traffic around or away from park	x																																							
19	Putting through traffic underground/covering open tunnels																																								
20	Transforming urban boulevard to park strip																																								
21	Greening tram beds crossing the GS																																								
22	Cutting park drives for cars																																								
23	Connecting to metro station																																								
24	Re-integrating derelict/brownfield/unused land														x																										
25	Connecting to highway																																								
26	Moving logistic activities and light industry													x																											
27	Integrating nature reserves																																								
28	Connecting separate parts over highway																																								
29	Connecting over causeway																																								
30	Connecting over/under local road	x																																							

Table A4. *Cont.*

	Type–Name/Count	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**Reorganizing Sports Fields**	**Reorganizing Sports Fields**	**Reorganizing Sports Fields**	**Reorganizing Sports Fields**	**No Type**	**No Type**	**Industry/Logistics Redesign**	**Brownfield Develpment**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Private Gardens to Parkspace**	**No Type**	**No Type**	**No Type**	**No Type**
	TFL/N°	N4	N17	N36	N45	N46	N49	N21	N32	N38	N15	N23	N24	N47	N54	N8	N10	N12	N13	N18	N19	N20	N25	N27	N28	N29	N30	N31	N33	N34	N35	N37	N39	N40	N41	N42	N58	N59	N60	N61	N62
31	Visual shielding																																								
32	Making fenced off grounds accessible integrating sports grounds																																								
33	Renegociating industrial land for shared use																																								
34	Connecting nearby housing projects with parkspace																																								
35	Re-designing ground floor and terrains of 60's housing blocks	x	x	x	x	x	x																																		
36	Developing real estate around GS																																								
37	Reorganizing open air sports facilities							x	x	x	x																														
38	Opening up impervious surfaces																																								
39	Rooftop park extension on commercial buildings																																								
40	Rooftop park extension on public buildings																																								
41	Creating passages in-between buildings																																								
42	Mega-roundabout																																								
43	Mega-block																																								
44	Part of private garden to parkspace																																				x				
45	GS as part of strategic site redevelopment																																								

Table A4. *Cont.*

	Type–Name/Count	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**60's Housing Public Space Redevelopment**	**Reorganizing Sports Fields**	**Reorganizing Sports Fields**	**Reorganizing Sports Fields**	**Reorganizing Sports Fields**	**No Type**	**No Type**	**Industry/Logistics Redesign**	**Brownfield Develpment**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Rural NGS Development**	**Private Gardens to Parkspace**	**No Type**	**No Type**	**No Type**	**No Type**
	TFL/N°	N4	N17	N36	N45	N46	N49	N21	N32	N38	N15	N23	N24	N47	N54	N8	N10	N12	N13	N18	N19	N20	N25	N27	N28	N29	N30	N31	N33	N34	N35	N37	N39	N40	N41	N42	N58	N59	N60	N61	N62
46	Connecting over water body																																								
47	GS in shared use with public services	x																																					x		
48	Transforming local road into GS																																		x	x	x				
49	Transformation public space into park																																		x	x	x				
50	Rooftop park on top of industrial building																																							x	
51	Reversing commercial building																																								
52	Demolishing existing building for creation of GS																																					x			
53	Converting parking space into GS																																								
54	Cutting parking spaces																																								
55	Activation of unused lawn		x						x						x																										

Table A5. Listing of identified opportunities for green space development and involved strategies 5/5 (continued on next page).

	Type–Name/Count	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**
	TFL/N°	P1	P2	P3	P4	P5	P6	P7	P8	R1	R2	R3	R5	R9	R10	R11	R12	R13	R14	R15	R16	R17
	High investment class–FULL scenario																					
	Middle investment class–SUPP scenario	x																				
	Low investment class–BASE scenario		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
1	Developing wetlands in valley bottom																					
2	Developing a blue-green network																					
3	Deploying walking and cycling trajectories	x	x														x					
4	Converting agricultural fields to park space with small scale agricultural character																					
5	Developing green areas around upstream tributaries																					
6	Cutting local road	x	x														x					
7	Connecting existing public green spaces																					
8	Halting housing development																					
9	Reversing housing development																					
10	Noise shielding																					
11	Integrating protected landscapes																					
12	Integrating estates																					
13	Connecting separate parts over 2 × 2-lane road																					
14	Connecting to railway station	x															x					
15	Covering open railroad trenches																					
16	Connecting to tram station																					
17	Extending park over local road up to sidewalk	x																				
18	Re-routing roads and traffic around or away from park	x																				
19	Putting through traffic underground/covering open tunnels																					
20	Transforming urban boulevard to park strip																					x
21	Greening tram beds crossing the GS																					
22	Cutting park drives for cars																					
23	Connecting to metro station																					

Table A5. *Cont.*

	Type–Name/Count	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**
	TFL/N°	P1	P2	P3	P4	P5	P6	P7	P8	R1	R2	R3	R5	R9	R10	R11	R12	R13	R14	R15	R16	R17
24	Re-integrating derelict/brownfield/unused land																					x
25	Connecting to highway																					
26	Moving logistic activities and light industry																				x	
27	Integrating nature reserves																					
28	Connecting separate parts over highway																					
29	Connecting over causeway																					
30	Connecting over/under local road																					
31	Visual shielding																					
32	Making fenced off grounds accessible integrating sports grounds																					
33	Renegociating industrial land for shared use					x		x	x													
34	Connecting nearby housing projects with parkspace																	x		x		
35	Re-designing ground floor and terrains of 60's housing blocks														x							
36	Developing real estate around GS																					
37	Reorganizing open air sports facilities				x		x									x						
38	Opening up impervious surfaces		x	x	x	x	x			x	x	x	x		x	x	x	x				
39	Rooftop park extension on commercial buildings																					
40	Rooftop park extension on public buildings												x									
41	Creating passages in-between buildings												x			x				x		
42	Mega-roundabout																					
43	Mega-block																					
44	Part of private garden to parkspace									x			x	x				x		x		
45	GS as part of strategic site redevelopment													x								
46	Connecting over water body																					
47	GS in shared use with public services																					
48	Transforming local road into GS			x			x			x						x						
49	Transformation public space into park	x	x		x												x					

Table A5. *Cont.*

	Type–Name/Count	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**	**No Type**
	TFL/N°	P1	P2	P3	P4	P5	P6	P7	P8	R1	R2	R3	R5	R9	R10	R11	R12	R13	R14	R15	R16	R17
50	Rooftop park on top of industrial building	x	x	x	x													x				
51	Reversing commercial building							x	x													
52	Demolishing existing building for creation of GS																				x	
53	Converting parking space into GS					x															x	
54	Cutting parking spaces										x	x										
55	Activation of unused lawn										x	x										x

Appendix A.1. Descriptive Summary of the Design Exercise Output

Appendix A.1.1. Metropolitan GS (n = 10)

The different approaches suggested for metropolitan GS development depend on the degree of urbanity of the surroundings. Common interventions that pertain to these types of OGSD are: (i) for the implementation of measures for developing a green-blue network; (ii) the need for deployment of walking and cycling trajectories; (iii) the acquisition and integration of farmland in order for it to function (also) as park space; and (iv) removing local roads or cutting traffic that divides the space into smaller segments. Other common strategies are the integration and connection of existing GS (including protected landscapes) into a metropolitan-size GS and noise shielding due to the proximity of traffic corridors. *Intra-urban* OGSD are specific in the sense that they most often require connections over a 2 × 2-lane road, require covering open railroad trenches due to the scarcity of open space, and can be made accessible by railway and tram for improved accessibility. *Peri-urban* OSGD often require land use change, including a halt for housing development in the delimited zone. Depending on their location, these public GS can play an active role in the relation between the city and hinterland, as natural water management zones (buffering upstream of the city or filtering and decontaminating downstream) [62] or as local food production areas, functionally related to farmers' markets in the city [63,64]. The spatial complexity is high in peri-urban areas, which requires creative approaches which do not only pertain to GS design, but also to the system design of peri-urban activities such as waste management, logistics, and production of energy, food, and goods. Moreover, these spaces have a specific role in the development of housing and transportation, as it is often beneficial to create a highly accessible metropolitan density on its edges, given the spatial quality these metropolitan GS provide [65]. Whereas *intra* and *peri urban* OGSD often leave very little options for choosing their position, *rural* OGSD can be positioned in a way that they serve as an ecological bridge between valleys. Other than the necessity for land use change and halting housing development, they benefit from reversing the existing sprawl of single-family houses. In general, metropolitan GS can be considered as green infrastructure, which is the upgrade of urban green space systems as a coherent planning entity [66]. If a green infrastructure is proactively planned, developed, and maintained, it has the potential to guide urban development by providing a framework for economic growth and nature conservation [67,68]. Such a planned approach would offer many opportunities for integration between urban development, nature conservation, and public health promotion [69].

Appendix A.1.2. City GS (n = 12)

Rural OGSD on the city level can be classified into three types, which are closely related and vary by their position in tributary valleys and the presence of existing private or public woodland. The scale of the public GS requires the deployment of walking and cycling trajectories. The three main types of city OGSD are: (a) *agriculture reconversions*, which lie at the source of tributary streams and consist purely of reconverted farmland (e.g., into a juxtaposition of small-scale farmland with high biological value and patches of meadows and woodland); (b) *valley parks*, which contribute to the green-blue network of tributary streams and GS and are created by connecting existing woodland; (c) *agriculture reconversions to valley parks*, which constitutes an overlap of the earlier mentioned types, and which due to the context most often require a re-routing of local roads. A fourth type is *urban space optimization*. The lack of available land leads to interventions of high investment, such as covering railroad trenches and connecting existing GS through creative use of available space. The high density of public transport allows these OGSD to be accessible from tram stops and most often also from railway stations. This type of OGSD requires cutting existing local roads due to the high density of roads in the urban context.

Appendix A.1.3. District GS (n = 38)

District-level OGSD can be differentiated into six types. The first type, *functional level scaling*, involves the inclusion of existing GS, residual spaces, and infrastructure interventions (e.g., covering railroad trenches, removing park drives, re-routing traffic to un-fragment and to provide space for the public GS). The difficulty of finding space of this size makes the tunnelling of through traffic an option to consider. This allows for the coupling of existing GS. These OGSD have a high accessibility by public transport. A second type is the *inner-city district GS optimization*. It requires extensive redesign of circulation and rethinking of street layouts to expand existing GS to the district level. This type involves predominantly late 18th century parks. *Inner city continuous spaces* are a type where a chain of lower TFL spaces are re-designed as one continuous public GS. Interventions include the transformation of public GS bordering streets into pedestrian space, opening impervious surfaces, cutting local roads, and re-routing local traffic in general. *Peri-urban district GS development* involves the use of agricultural land, mostly in the source area of tributary streams, with parts of the area delimited as protected landscape. Potential spaces are often near railways or highways, which requires noise shielding for their realisation. *Rural district GS development* depends—as with other TFL—on the reconversion or integration of agricultural land. Other less frequently occurring OGSD types are *publicly accessible estates* and *GS development in tributary valleys*. In areas with space scarcity, estates often have the right size for district-level OGSD. Therefore, one of the strategies can be (partly) opening the domains of these estates. GS development in tributary valleys is part of the large-scale public GS development possibilities in the range of the city-district level that occur in less urbanised valleys.

Appendix A.1.4. Quarter GS (n = 19)

The OGSD that were reoccurring for the quarter level are *expanding existing parks*, *conversion/reorganization*, *green roof on commercial buildings*, and *converting farmland to park space.* The first three types all include a form of expansion of existing GS. *Expanding existing parks* involves looking for greening potential in the public space around the existing park, whereby through traffic is put underground for the benefit of the public GS. Connectivity with the public transport network can be improved through the new layout. *Conversion/reorganization* involves the relocation of mono-functional sport facilities or reorganizing the area to attain a more publicly accessible and multifunctional area with a more natural character. In practical examples, these conversions have potential for real estate development and include adjustment of local roads. *Green roofs on commercial buildings* can activate spaces on top of these buildings near public GS. *Converting farmland to park space* is a peripheral form of quarter-level public GS creation through land use change.

Appendix A.1.5. Neighbourhood GS (n = 62)

Rather than combinations of interventions, OGSD types for the neighbourhood level involve single-type interventions of which the naming is self-explanatory. They have a high diversity and often include private terrains. In many cases, realisation requires specific actions of a private partner or of administrative authorities, such as for *public space redevelopment of modern housing blocks*, the transformation of *private gardens to park space*, *publicly accessible estates*, *brownfield development*, *railroad optimization* (mostly covering tracks that are below street level), and *rural neighbourhood GS development.* Despite the relatively small scale, in the first two approaches the number of stakeholders can be very high, and therefore the realization will require an elaborate participative process. Other than these, public spaces can be reorganised too. Strategies include enlarging existing public GS or creating public GS by *reorganizing sports fields* that are accessible for a limited public, and the creation of the *super-block.* The latter is a Spanish concept where a cluster of nine urban blocks is made accessible for motorised vehicles only by means of one-way loop streets and only for deliveries or drop-offs [70]. This leaves room for the development of a green structure of neighbourhood scale.

Appendix A.1.6. Play GS (n = 8, Focal Area) and Residential GS (n = 13, Focal Area)

Given the small reach of play GS (350 m) and residential GS (170 m), solving the lack of availability for these types of GS for the whole study area is a task beyond the scope of this study. Therefore, a focus area of 1.5 km^2 was determined. The location of this area was based on low overall GS proximity score, high imperviousness, and low average income, assuming that if GS provision in this area could be substantially improved by design, it will be possible in other areas too. Design exercises showed that the area selected can be provided with GS (8 play GS and 13 residential GS), and possible strategies for improving GS provision were deducted from these examples. Play GS—as the name indicates—are predominantly aimed at children. In the design workshops, it was determined that to assure its use, equal attention should be given to the design of the space and the design of children-friendly routes towards it from the surrounding neighbourhood. Five types of interventions were identified: *green roofs of public services*, *open schoolyards*, *boulevard segments* (in streets of 30 m and wider), *public space redevelopment of modern housing blocks*, and *large free parcels*. For residential GS, the same type of interventions reoccur consistently, with the additional type of *reconversion of parking lots*. Residential GS can also be constructed by *combining parts of private gardens into a public green space*. In this TFL, also *greening private parking lots* is an OGSD that is recurring frequently. In these lower TFL, the potential of streets shows the necessity of re-thinking the role of streets as mono-functional passing and parking spaces [39], towards green multifunctional connecting spaces for neighbourhoods, not only making homes accessible, but also connecting people. Multi-functionality also returns in the strategy of opening up school grounds for neighbourhood recreation in off-hours, which is currently being investigated by the Flemish community responsible for educational infrastructure in the study area [71].

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